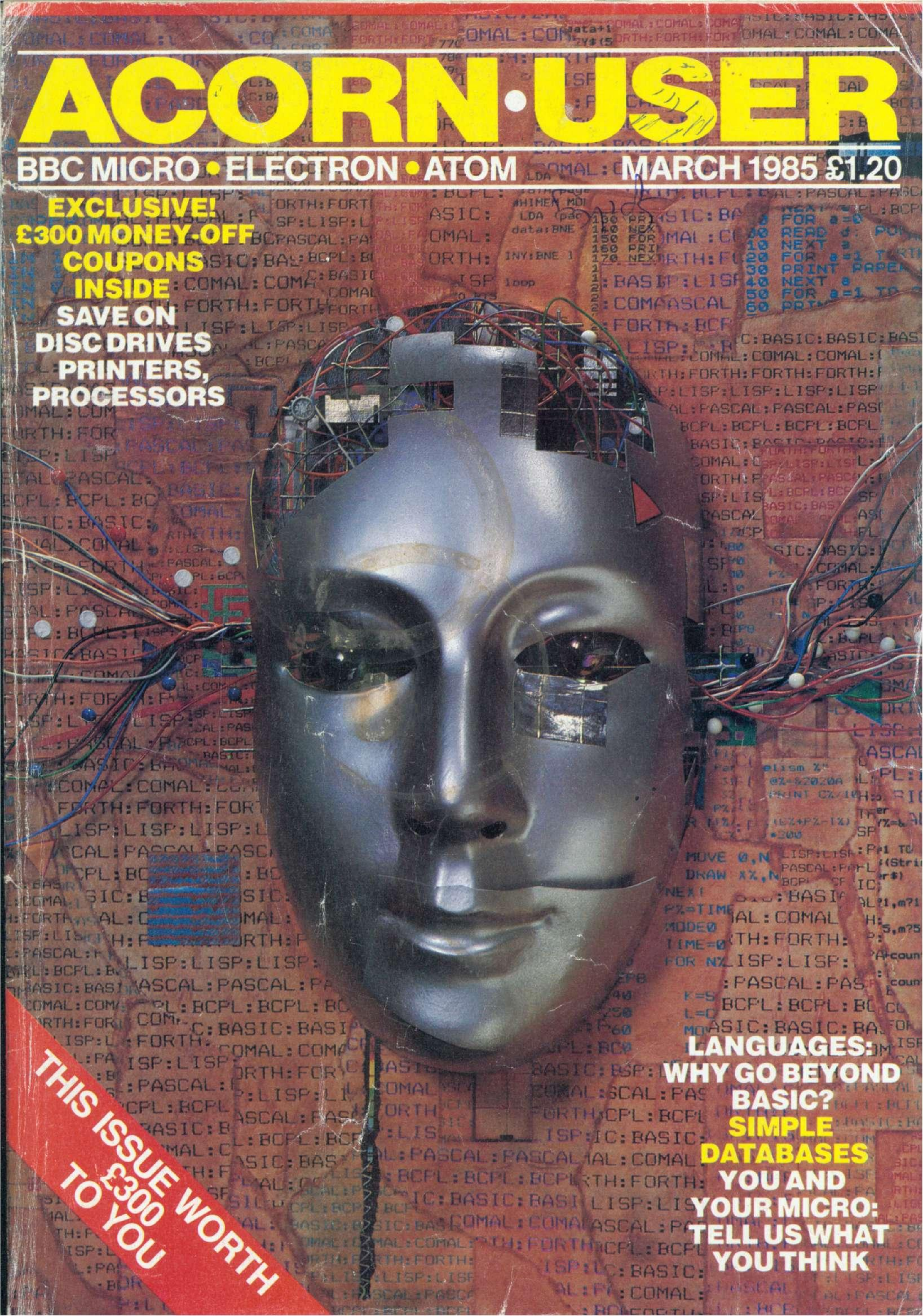

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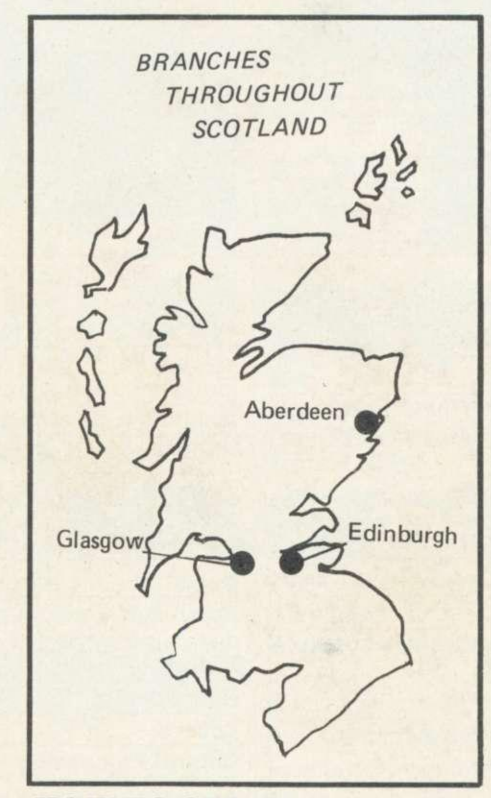
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NEW USERS



ATOM

YELLOW PAGES

The major listings for this issue are printed in the yellow pages section starting on page 97. These are also available on cassette and in bar code format to save you typing them in. Details of these on pages 95 and 108

REVIEWS



REGULARS

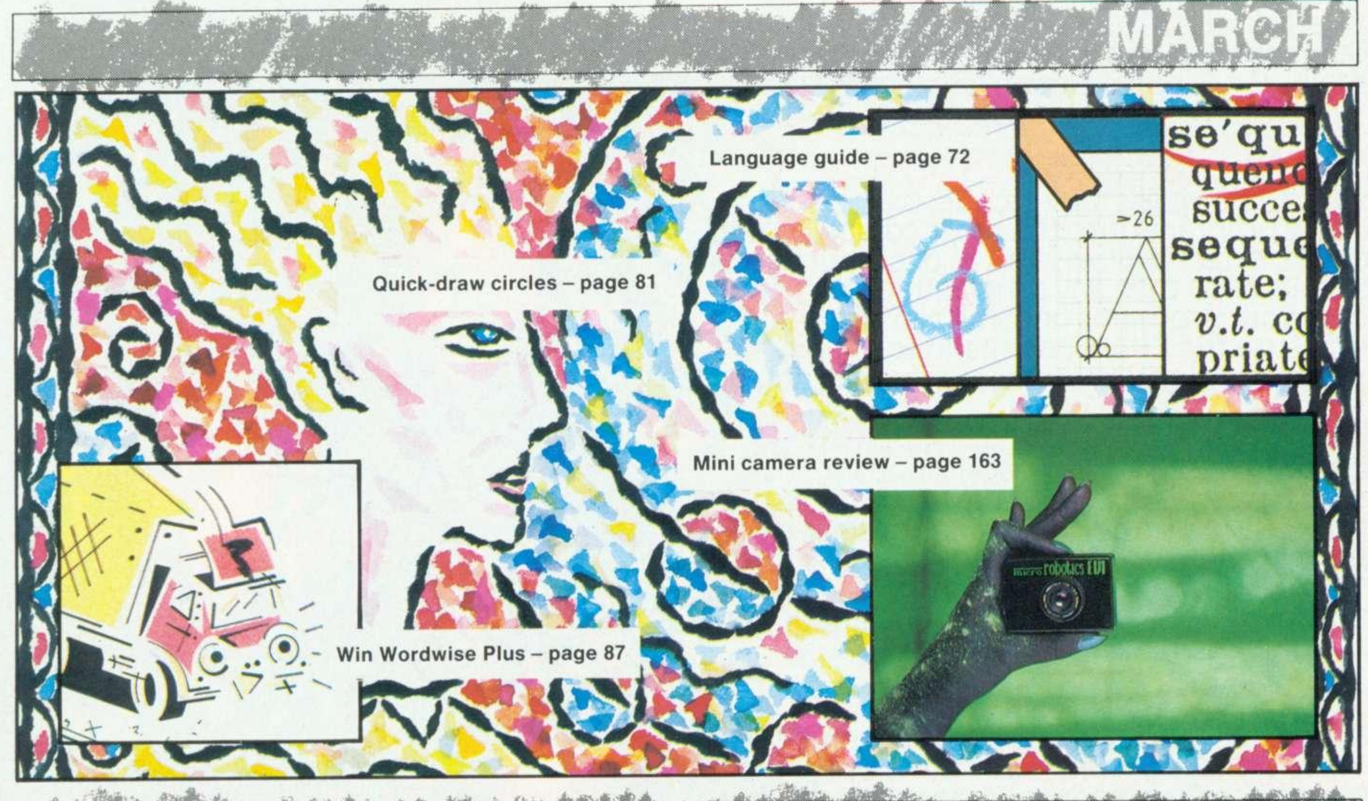
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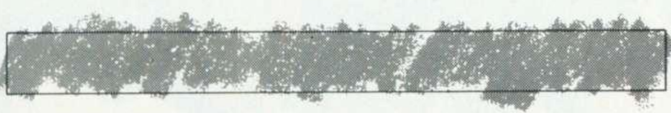
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MARCH



EDUCATION





Acorn User
March 1985
Issue number 32

Cover image by
Russell Mills

Cover photograph by
David Buckland

FEATURES

NEXT MONTH

How to use the Z80 second processor

Colours by interrupts

An introduction to Logo

Reviews

The AMX mouse and modem software under scrutiny

Notes for authors

Acorn User welcomes submissions from readers. Articles should be typed, double-spaced text with diagrams and screen dumps on separate sheets, or on disc in *Wordwise* (saved as a *SPOOL file using option 8) or *View* format. Leave large margins to allow space for editing.
Please enclose all programs on disc or cassette, with listings if possible. Also follow the style used in presenting listings in the yellow pages section. Photos should be 35mm, or larger, transparencies, or 5in by 7in black and white prints. Ensure your name is on everything, and keep a copy. Enclose a suitable stamped, addressed envelope if the submission is to be returned. Attach a short letter with the article giving its title with a day time phone number if possible. Address your article to the Technical editor. Articles are acknowledged on receipt, but not submissions for the regular columns, letters pages and competitions. Please limit telephone enquiries to the Technical editor to Wednesday and Thursday afternoons.



Oxford Pascal is Fast

Oxford Pascal compiles down to FAST COMPACT P-code, giving you the real speed and power of Pascal, together with the ability to compile very large programs.

Oxford Pascal is Standard

Oxford Pascal is a full extended implementation of Standard ISO Pascal. This means that you can compile any Pascal program (subject to size), written on any computer, anywhere.

Oxford Pascal is Compact

Because it compiles into P-code, Oxford Pascal reduces programs into the most compact form possible. In fact it allows you to pack more code into your BEEB than any other language, and should your programs become too large, you can still use the CHAIN command to overlay limitless additional programs without losing data.

Graphics & Sound Extensions

In addition to the entire Pascal language, Oxford Pascal features a whole range of Graphics (all modes) and sound extensions designed to make maximum use of the BBC computer. Oxford Pascal also provides numerous extensions such as hexadecimal arithmetic and bit manipulation instructions.

Oxford Pascal in Education

In Education, Oxford Pascal is fast becoming a *de facto* standard. It is already the most popular Pascal on the Commodore 64, and will soon be released for the Spectrum and the Amstrad. In fact, Oxford Pascal will soon be available for 90% of the computers installed in the U.K., and is already available in German, French, Swedish, and American versions. **Students and teachers alike find that it makes sense to use a standard implementation of Pascal across the whole range of educational micros.** Call us for details of our generous educational discounts.

Resident and Disc Compiler

Oxford Pascal comes in two forms:

For Tape Users...Oxford Resident Pascal a compiler located largely in ROM which is available at any time. Programs can be written and compiled on the spot without disc or tape access, and compilation is fast enough to make using the compiler much like using the BASIC interpreter. Thus, learning Pascal is a simple interactive process. Some 15K of memory is available for user programs, the remainder being reserved for compiled object code.

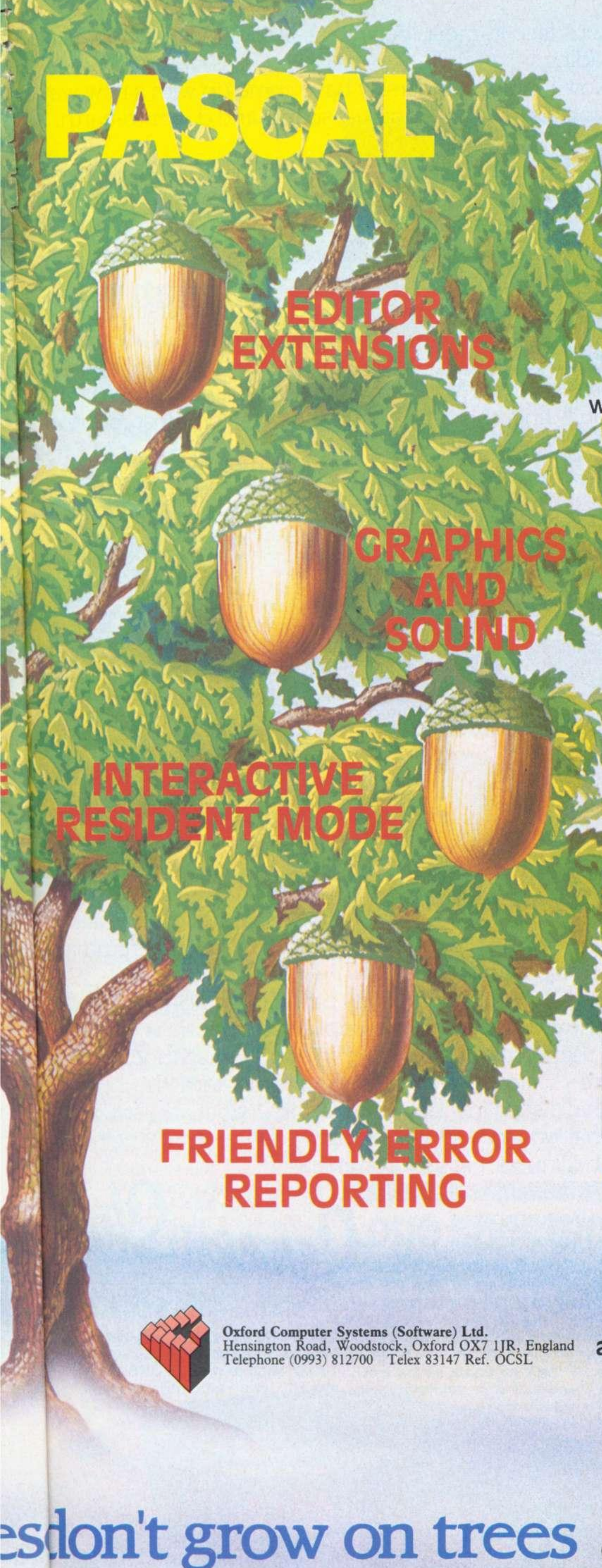
For Disc Users...Oxford Disc Pascal offers all the above PLUS...a full disc compiler which is capable of using the WHOLE memory for Pascal object code, it is supplied with a powerful LINKER, allowing you to break large programming tasks down into separately compilable, easily-manageable files.

Manual

Both these compilers come with a manual which has been carefully designed, not only as a quick reference guide, but also as a full tutorial for those new to Pascal.



Compilers like thes



BBC and Electron

Friendly Error Messages

Many compilers produce little more than an error and line number to help correct mistakes in Pascal programs. Oxford Pascal however, gives you one of 49 friendly and informative error messages, messages which not only indicate the reason for an error, but also print out the line in question with a pointer to the exact position where the error was detected. Run-time errors are reported using line-numbers from the original source-program with a full explanation of how the error occurred.

Powerful Editor

With Oxford Pascal there is no need for you to learn how to use a new Editor. Pascal programs can be entered in exactly the same way as BASIC programs, without the need to learn any new commands. When you are used to using Pascal, you will find our extensions to the Standard Editor even more useful. What is more, Oxford Pascal allows you to mix BASIC and Pascal together, in much the same way that you can mix BASIC and assembler. In fact you can, if required, mix all three together...BASIC, Pascal and assembler...in one program.

Stand Alone Code

Unlike other compilers, Oxford Disc Pascal allows you to compile on the BBC and then relocate your program so that it will run on the BBC **and** on the Electron. The relocated program will run without a Pascal ROM and can be loaded and run from tape or disc just like any other program.

This means that you can distribute or sell your software freely and without the need for **ROM**s, to run on either of the above machines.

Price/availability matrix

	BBC 'B'	ELECTRON	C64	SPECTRUM
DISC	£49.95	Not yet!	£49.95	Available April 1st 1985
CASSETTE	£39.95	£59.95 inc. Cartridge	£22.95	

All prices are inclusive of VAT Please add £2.00 for postage and packing.

Oxford Compilers — The Future

During the next year, we at Oxford will be releasing a series of language implementations such as C, and Modula 2, for the BBC, and other popular micros.

These compilers are being built, using the most modern techniques in **automated** compiler construction, and will bring to the micro-user, a level of robustness and efficiency, only now becoming available to mini and mainframe users.

Oxford... the **Compiler Compilers.**

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Please rush me my copy of Oxford Pascal. I enclose £ .... including £2 postage and packing
My computer is BBC 'B'☐ ELECTRON☐ C64☐ (Please tick as appropriate)
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Books 1 and 2 of each series form a complete guide to BASIC programming for that computer.

For the more adventurous programmer, Books 3 and 4 explore the creative world of computer graphics.

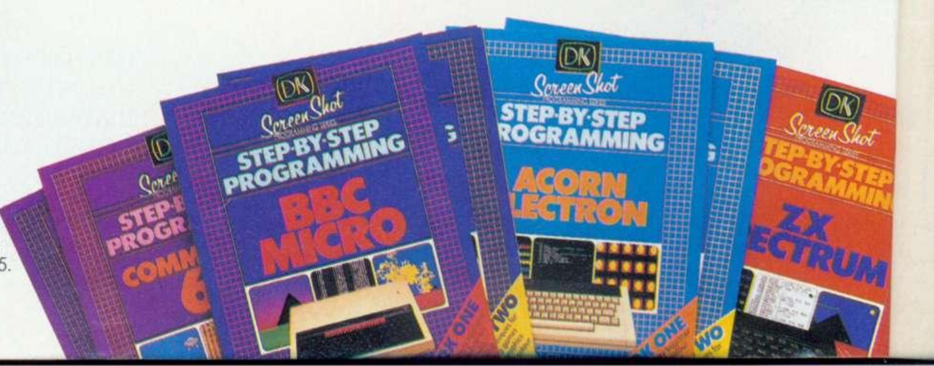
In the words of a reviewer in 'Big K' magazine, Screen Shots are "...clearly and expertly written with the best layout I have seen in a book of this sort...what you see is (for once) what you get. Outstandingly good and for beginners or semi-beginners: highly recommended."

The message is clear. If you really want to get into programming, get a Screen Shot.

With anything else, you won't be fully in the picture.

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Screen Shot books available from larger branches of BOOTS, MENZIES, WH SMITH and other leading bookshops and computer stores. In case of difficulty, write to: Dorling Kindersley, 1-2 Henrietta Street, London WC2E 8PS.



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Screen Shot Books 1 and 2 available for Acorn Electron, BBC Micro, Commodore 64, Sinclair ZX Spectrum, Sinclair ZX Spectrum+, Apple IIe. Books 3 and 4 available from April 1985.

Dorling Kindersley Publishers Limited.

BBC micro in a class of its own

BRITAIN's secondary schools have flocked to join the micro revolution to the point where an astonishing 98 per cent of them own classroom computers . . . and with Beebs in more than three-quarters of them.

This latest proof that the BBC Acorn is in a class of its own when it comes to micro education arrived with the results of a government-funded survey showing that the typical secondary school has around nine computers.

However, government education departments are showing signs that their thoughts are increasingly turning from eight-bit machines like the Beeb to more powerful 16-bit micros.

This was confirmed by Junior Education Minister Bob Dunn at the recent exhibition on High-Technology and Computers in Education staged at London's Barbican Centre.

Up to now, he said, software supplied through the Microelectronics Education Programme had been for eight-bit computers. However, the MEP has contacted software producers urging them to submit proposals for 16-bit programs.

Meanwhile teachers are busily planning to expand their present systems.

The survey, which was conducted among secondary schools in England, Northern Ireland and Wales, discovered that 85 per cent were planning more hardware over the next two years. One of the main priorities was to introduce or extend networks.

Of schools with micros, by far the two most popular were the BBC model B, found in 77 per cent of the schools surveyed, and the RML 380Z in 62 per cent.

Beebs aid famine

OXFAM's Glasgow office is about to take delivery of its first BBC system to cope with aid to Ethiopia and other countries.

However, a second system is urgently needed. Contact Keith McBean, Ardrossan Round Table, Rothbury, Alton St, West Kilbride, Ayrshire, tel: (0294) 64225.





The Beeb: £50 off in some high street chains; the Electron: now £129

Electron meets Sinclair head-on

ACORN has slashed the price of the Electron to meet the £129 price-tag on the Sinclair+ as part of an aggressive sales drive to meet Press and market accusations of complacency.

The company has also been re-organised internally to tackle specific market areas better, with a shake-up right through from research level to management.

The new stance was heralded when Chris Curry hit out at Press reports that he regarded as influential in causing the drop in Acorn's share price, branding them as 'inaccurate and uninformed' and saying they were beginning to resemble a 'vendetta'.

This was followed by slashing the price of the Electron by a third and announcing special package deals to schools on the BBC micro – but no change in the high street. Although there is now a £50 exchange scheme for old micros several chains are nevertheless offering £50 off the machine.

Chris Curry afterwards told *Acorn User* that he had appointed Alex Reid, formerly of British Telecom, as acting chief executive on the Acorn board. This was done, he said, 'to help restructuring of the company' and 'so that we can meet our markets better'.

Since then Acorn has written to education authorities offering them packages on the Electron, BBC, languages, second processors and networking. These will be available through dealers, thus deflecting criticism about lack of support.

The marketing department has been revamped and expanded since last year. A spokesman said: 'We have superb products and we haven't marketed them as fully as possible. This will change.'

As we went to press Acorn shares were suspended at the company's request.

ABC goes for special sectors

PRICES for all but two of the new range of Acorn business computers have been announced by Acorn.

The bottom-of-the-range Terminal comes in at £799 (plus VAT), the Personal Assistant £999, ABC100 £1,599, ABC110 £2,999, ABC300 £2,599, and the ABC310 £3,999.

Mike Tweedie, who is looking after the range, said he was not looking to compete with the established companies head-on. Instead he was aiming for the BBC market – people who had bought a Beeb and were carefully examining the possibilities of upgrading. Machines would be packaged with software for specific markets – eg farmers, doctors and dentists.

The first group to be catered for would be farmers in a package that would, he hoped, be out by the summer. 'The way to sell,' he said, 'is to speak to the end user and look for co-operation with recognised bodies in specialist areas.'

Logo spectacular features in festival

A LOGO Spectacular, robotics and the role of computers in the community, voluntary work and business are all part of this year's London Computer Festival.

The action starts on April 9 and culminates in a four-day show centred on a dome in the open Piazza around Covent Garden, on April 17-20. At the same time, an exhibition will be held at Central Hall, Westminster.

Schools, community groups, ITECs, the GLC and various companies are taking part.

The Logo Spectacular, for example, features schools and children showing what they have done. 'It's designed to be different to computer shows,' said the organiser Richard Olney. 'We want to have turtle hockey and lots of robots running around and we hope to create total chaos.'

This event takes place on April 13 at the address below and at a venue in the docklands on the previous day.

Schools just starting out can get ideas and discuss the problems they're having with Logo, Mr Olney said. Teachers interested in taking part should contact him at the London New Technology Network, 86-100 St Pancras Way, London NW1, tel: 01-267 0642.

Readers who want details of the festival should contact Jim Lagden at the Covent Garden ITEC, 99-103 Long Acre, London WC2, tel: 01-240 8377.

Clwyd Technics

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MK V1

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Trekker is a multi-function classroom robot vehicle which does much more than merely moving and drawing. Designed for education but also ideal for the home enthusiast. ***Trekker*** is supplied with over 30 pieces of software. Its applications include:

* white line follower * bar graphs
* pen software * angles * polygons
* area measurement * length measurement
* co-ordinates * music * sound

- all of which are graphic, colourful and interesting. The complete ***Trekker*** package includes software guide, user guide, function key overlays and everything you need to teach control technology. The pupil worksheets, OHP transparencies and project work suggestions make ***Trekker*** easy to teach and great fun to learn.

Trekker requires no technical knowledge. An absolute beginner, following the instant start guide, can use his ***Trekker*** robot vehicle within 2½ minutes straight from the pack.

No assembly necessary. ***Trekker*** plugs directly into your BBC microcomputer user port with a single cable (*supplied*) and does not require any other cables, power units or connections.

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New name and box for £50 modem

THE £50 Unicom modem has been renamed 'The Demon' and software is available for it on ROM for £20 (prices exclude VAT).

A spokesman pointed out that the change was due to a clash of names with two other companies.

Advertising for the modem was withdrawn in December because of a hold-up in production, but the mail order backlog was expected to have cleared by the time this magazine came out.

The price includes manual, power supply and leads. The software supports auto dial, Prestel, bulletin boards and Telecom Gold.

Contact Demon Products Ltd, 20 Orange St, London WC2H 7ED.

Tape to disc ROM

FRUSTRATED disc users might find a friend in the TDROM from Vine Micros. Claiming 99 per cent effectiveness, it will transfer protected software from cassette to disc via the chip.

Software houses will be pleased to note that the TDROM must be present for the transferred program to be re-loaded and run.

All available RAM from &400 to &7FFF is used, so even the longest programs can be transferred. The TDROM comes in single and double density formats at £18. Vine Micros can be reached on (0304) 812276.

Guitar tutor

STRIKING a chord for novice guitar and keyboard players is the release of two software packs for BBC and Electron users.

Guitar Chord Tutor generates chord shapes on a display of the top six frets and indicates finger positions, and up to 144 chords can be called.

Keyboard Chord Tutor provides the same information for use with the keyboard.

Contact the suppliers, P R Adby Associates on (0323) 899202 for details.

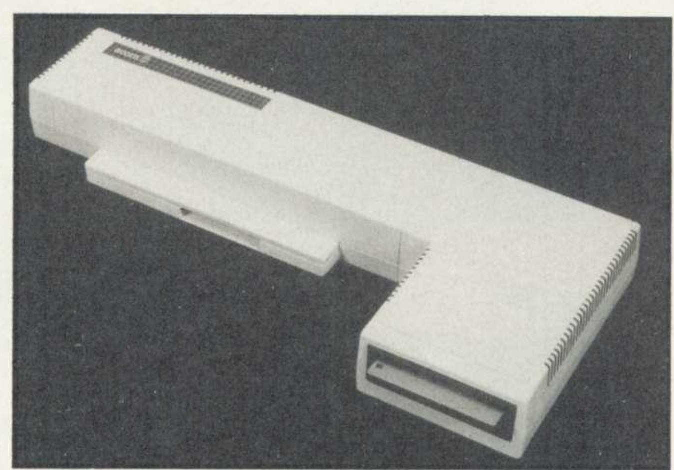
New DFS in Plus 3 add-on for Electron

by Bruce Smith

THE Plus 3 finally made its appearance in the shops in January featuring the new Acorn Advanced Disc Filing System (ADFS).

The ADFS, used in conjunction with the WD1770 disc controller chip, is capable of supporting both single and double density discs.

Unlike the standard DFS, the ADFS supports a 'hierarchical' filing system. This means each directory on the disc may contain up to 47 files (as opposed to 31 per disc on the standard DFS). In turn, each directory may itself be composed of other directories, so that a hierarchy or tree-structure of files may be built-up. (See the April 1984 issue of *Acorn User* for details on this type of filing system.)


Plus 3 with 3.5in disc drive for £229

The penalty to pay for all this is the loss of 3.5k of memory: PAGE is set to &1C00 (as opposed to &1900 on DFS). This is because under the new file handling system disc catalogue details are stored in RAM rather than extracted from the disc itself each time they are required.

The Plus 3 is supplied with a built-in 3.5in disc drive. However, 5.25in drives compatible with the BBC micro can be connected.

The Plus 3 bolts directly on to the Electron and does not need the Plus 1 (this fixes to the Plus 3 if it is used.)

Before the disc interface can be used, a foil shield supplied must be stuck to the end of the Electron to minimise interference.

A new power supply to replace the standard Electron plug is included.

The Welcome disc contains a variety of useful disc utilities, including formatting and verifying programs which have, surprisingly, been omitted from the firmware itself.

Pace, who 'launched' the first disc interface for the Electron at last year's *Acorn User* Show, have now 'discontinued' Le Box.

A spokesman for Pace said that this was due to 'the excessive price of purchasing the 8271 disc controller chip' it uses.

'Prices for a single chip had risen to over £80 at times,' he added.

He went on to say that Pace would consider a re-launch should the price of 8271s drop to more reasonable levels.

BBC micro upgrade likely

BBC micro owners look likely to be given the chance to upgrade to the ADFS, although this would involve fitting an extra internal board.

The Plus 3 manual refers to the system being BBC compatible, and as it is in ROM, the company must see it as a permanent release.

Using ROM chips is initially more expensive than EPROMs and the fact that the old 0.9 DFS has never been ROMmed suggests that Acorn regarded it as a temporary measure.

It also leaves the door open for an exchange service as EPROMs can be erased and used again.

The ADFS is capable of driving a Winchester hard disc connected to the 1MHz bus.

Like the Plus 3, the BBC version should work with the single/double density WD1770 disc controller chip, which poses an interesting dilemma. Acorn has always been against extra circuit boards to plug inside the present case because of upgrade and reliability problems. Versions are on test, however.

This adds weight to the rumours of a 'Model C' or BBC+ micro this year. An 'Issue 10' board is known to exist which contains many of the features at present provided as add-on extras.

This could include additional sideways ROM sockets, bringing the on-board total to eight; an extra 32k of 'shadow' RAM, 20k of which would support screen memory as with the Aries B20 – thereby freeing all the user RAM to &7C00 for programs.

The remaining 12k could be used as dedicated sideways ROM workspace, leaving PAGE set at &E00 as on a cassette-based BBC micro.

Software compatibility would pose problems. Unprotected software could be transferred to the ADFS format, but protected programs would prove untransferrable.

The appearance of a BBC+ is unlikely to take place until existing stocks of BBC micros have been reduced.

Acorn spokesmen are tight-lipped over the whole affair. When asked if the ADFS would be part of a BBC+, the reply was: 'How can I comment on something that doesn't officially exist?'

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Sky Baby for astronomers

SKY BABY, the astronomy package by Ronald Alpiar reviewed in January's issue, is still available and has not been republished by Century as *Starfinder* as readers may have been led to believe.

***Sky Baby* is designed for the more professional astronomer who wishes to know how the software works and to alter it. A manual is provided to do this and the author will be pleased to help users.**

***Starfinder* is for less experienced users, without specialist knowledge of programming or astronomy.**

The software was written by Alpiar, with a book by Heather Couper.

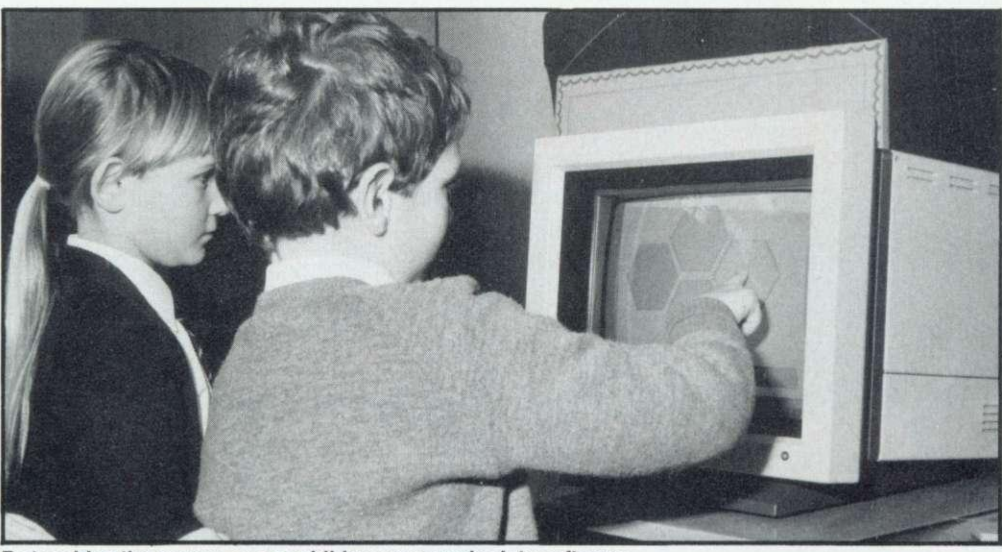
***Star Baby* costs £12.50 from Ronald Alpiar, Stellar Enterprise, 84 Dudsbury Road, Ferndown, Wimborne, Dorset BH22 8RG. Tel: (0202) 575234.**

Bridge exchange

PLAYERS of Alligata's *Contract Bridge* can exchange their present cassettes for the improved version for a quid. Players may upgrade to disc for £3.

New versions have been available since January and are marked BRIDGE 85 on the inner label.

Contact Alligata Software, at 1 Orange Street, Sheffield S1 4DW.



By touching the screen, young children can manipulate software

Touch screen cuts out need for BBC keyboard

MICROVITEC is to market a touch screen device invented in a London day school for handicapped babies and developed with funding from the MEP.

The touch screen does away with the need to type at the keyboard. Instead, even the youngest children can just point at a TV or monitor screen to manipulate software.

John Sanderson, the inventor, explained that the touch screen works by transmitting a lattice of infra-red beams across the front of the screen from two of its sides. These are detected on the other two sides, so the position of an object breaking the beams can be calculated by the computer and used to work out the response.

He added that software can be adapted to make use of the touch screen, and that the programs supplied were developed in a school.

Microvitec will release the Touchtec 501, as it is called, in late April for £201 (plus VAT) to the education sector. This version is designed to slip over the front of Microvitec monitors and has a stand to tilt the monitor. It plugs into the 1MHz bus and comes with a handbook and nine demonstration programs.

Mike Bostock of the MEP pointed out that the keyboard was often the greatest barrier to people using a computer and that the touch screen could remove this without affecting the use of the computer for other things.

The infra-red technique described above was pioneered for military applications (originally with incandescent light bulbs), and John Sanderson started applying it about four years ago with mentally and physically handicapped children aged up to seven.

He has produced his own touch screen called the Cheyne Scribbler, after the road of the day school where he works. One of his applications is called Chatter. This enables children to point to a word on the screen which is then 'spoken' by a voice synthesiser. The 'voice' can be adapted to sound like an adult or child.

The Scribbler will work with any TV or monitor. It can be detached and placed on the floor or a table up to a yard away from the computer. It costs £280 (plus VAT) from 29 The Heights, Foxgrove Road, Beckenham, Kent BR2 2BY.

Prestel special for schools

CHILDREN and teachers will be able to use Viewdata from within the classroom, with the launch of Prestel Education, which includes several databases.

The four main databases presently run are accessed from a main menu:

- EDIT aims at providing a current awareness service with a view to the exchange of ideas and news on information technology (IT). In particular the concept of 'microviewdata' – a sort of DIY Prestel for school use.
- ECCTIS – a gateway to the Open University's computer allowing access to details of further educational courses six weeks or more in length.
- School Link, run by *Educational Computing*, provides news and views on microcomputers in education.
- COIC provides up to date information on a wide range of career options, supplied by the Manpower Services Commission.

Details on any subject can be dialled up by the teacher or student, and downloaded onto disc for future reference.

All the usual Prestel pages, which number over 300,000, will be available to schools, including Micronet 800, but at a reduced cost. Charges will be £49 per quarter, and Prestel says the average total yearly bill, including phone charges, for a subscribing school would be between £250-£300 per annum.

The quarterly charge includes up to 10 hours free use of Prestel in the daytime (though phone bills still need to be paid!) plus a £10 allowance towards the cost of charged pages. All educational pages are free.

The system has been developed with the Council for Educational Technology (CET), which will be helping to develop viewdata training courses and media packs.

An £80 equipment package will enable schools to buy a modem and software to convert their BBC micro into a Prestel terminal.

For a free information pack, write to Council for Education Technology, 3 Devonshire Street, London W1N 2BA.

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FOR MORE AREA DEALERS SEE PAGE ► 31



Assembly language: the TV arclights expose the peers as out of touch with computers in education

Micros kick off Lords on TV

by Bill Penfold

THE historic, first televised broadcasting of parliament could hardly have begun more appropriately. Their Lordships launched themselves into the 20th century by probing the training for new technology . . . and the use of school computers.

On screen it looked marvellous. Red leather benches packed with peers, gold and gilt glistening in the arclights, and a discernible buzz of excitement.

The cameras went on air and Lord Orr-Ewing rose. 'How many computers are now in use in schools in the United Kingdom and how many teachers have been trained to instruct in their use?' he asked.

Live televising of parliament had arrived.

Almost immediately, though, it revealed just how out of touch even some ministers can be about important aspects of computer education – and unsympathetic some of their supporters are towards the subject.

It was the Earl of Swinton who replied for the government, reporting an estimated 80,000 microcomputers were now in schools with at least 120,000 teachers trained to use them. Mutual congratulations all round until Baroness Lockwood (who took Chris Curry to task last year) queried what was actually happening in the classroom.

The Equal Opportunities Commission and others, she pointed out, had shown girls were not getting a fair share of classroom experience with the micros.

What, Lady Lockwood wanted to know, was the government doing about it and was the government taking this into account with teacher training?

This well-documented aspect of computer studies, however, was all news to the Earl of Swinton.

In fact he didn't really believe it.

'It would surprise me if that were in fact true,' his Grace informed their Lordships.

But he promised: 'I shall take great pleasure in looking into it and coming back to the noble Baroness about it if it is the case.'

However, not all the peers appeared so enamoured of the micro.

Certainly not government backbencher Lord Harmar-Nichols. As far as he was concerned, 'Many people hope that this obsession with computers and such-like will not interfere with paying real attention to developing the natural talents of reading, writing and arithmetic in the young people of today.'

That fortunately was not a view shared by the minister. It was, he assured the House, not a choice between the 'Three Rs' and computing – 'the two can go hand in glove.'

Doubts about the use of computers in education were echoed from the Opposition benches by Lord Alexander of Potterhill. He suggested the government should ensure 'children in our schools reach an adequate personal standard in numeracy and literacy before they embark upon a course in computers.'

This gave the minister the opportunity to remind the Lords that 'some children with very severe learning difficulties are motivated by computers.'

The Earl of Swinton explained: 'Because of computers they can often find the encouragement to help them in their basic reading and writing skills. I feel that the two go together.'

Just like their Lordships and television.

Software releases for AMX mouse

AMS has announced two new software packages for the AMX Mouse.

The Desk Calculator pack, supplied as two discs, is a mini-office system and includes calculator, disc catalogue, memo pad, telephone directory and appointments calendar. Full use is made of icons and the built-in mouse software.

The second package is a utility disc for AMX Art supplied with the mouse. It will include a zoom facility that will enable changes to be performed at pixel level.

The calculator pack will sell for under £30 and received its first public showing at the recent High Technology and Computers in Education exhibition. It should be available this month.

For more information contact AMS on (0925) 602690.

On radio

As we went to press we were unable to confirm whether the lovely Barry Norman would be back hosting Radio 4's *Chip Shop*. However, the series will be back on the airwaves in April.

On television

BBC TV's *Micro Live* is appearing for the last time in the present series on Friday March 8 at 6pm and will be repeated the following day at about 3pm. Another series is being planned for the autumn.

4 Computer Buffs, the new series on Channel 4, went on air on February 11 at 5.30pm. The series is weekly and is seven programmes long. Their aim is to provide news and current affairs for serious computer users, to maximise the potential of computer hardware and to tell you what can be achieved by a modem and the cost of a phone call.

On show

□April 16-18, Northern Computer Show '85, Belle Vue, Manchester. Contact: Mike Birch/Chrissy Cottle, 01-643 8040.

□March 1-2, Educational Software Fair, Dauntsey's School, West Lavington, Devizes, Wiltshire. Contact: Peter Harris, Lavington (028481) 2325 or 2289.

To contact

□Acorn Customer Services (0223) 210111

□Radio 4 *Chip Shop*'s Chipline:

London 01-790 3400
Liverpool 051-236 8474
Birmingham 021-355 6144
Bristol (0272) 279494

□BBC TV's *Micro Live* bulletin board is on 01-579 2288 (type INFO BBC on Telecom Gold electronic mail system).

□BBC Computer Literacy Project, Broadcasting Support Services, PO Box 7, London W3 6XJ. Please send stamped-addressed envelope.

□MEP (Microelectronics Education Programme), Cheviot House, Coach Lane Campus, Newcastle-upon-Tyne, NE7 7XA. Hardware and software support for schools. Please send sae.

□MAPE (Micros and Primary Education), c/o Barry Holmes, St Helen's Primary School, Bluntisham, Cambs. User group for primary teachers. Please send sae.

□MUSE (Micro Users in Schools and Education), PO Box 43, Hull HU1 2HD. User group for teachers and parents. Please send sae.

□National Extension College, 18 Brooklands Ave, Cambridge CB2 2HN. Educational and training courses on the BBC micro. Please send sae.

□CET (Council for Education Technology), 3 Devonshire Street, London W1N 2BA. Government body which oversees MEP. Please send sae.

□Software Limited configure CP/M programs for the BBC micro. Write for a catalogue to No 2 Alice Owen Technology Centre, 251 Goswell Rd, London EC1N 7JQ. Tel: 01-833 1173.

For help

□To contact *Acorn User* authors, write c/o the editorial address given on page 2.

□Seikosha AP/GP100 printer help sheets are available from *Acorn User* for 50p, plus sae. These consist of three programs, including a screen dump, and three pages of notes on using these printers.

□Monitor choice: Photocopies of the review of four monitors, plus a set of nine test programs from the June issue cost 72p (inc post). A copy of the issue costs £1.25 (see page 93).

□Bulletin boards: Information on 26 free-access boards was given in the October issue. 54p for photocopy (see page 93).

□For *Acorn User* cassettes, discs, back issues, binders, contact PHS Mailings on (02934) 72208 (see page 96).

On Prestel

TUBELINK is a database for users of second processors on Viewfax, which is part of Prestel Microcomputing.

Pages start at ★258216# and are aimed at programmers with 6502 and Z80 add-ons (Torch and Acorn).

For disc

□Tape to disc transfer utility: June 84, p55.

□40/80 dual format discs: produce discs readable on both types of drives, Feb 84, p69.

Blunderbox

□HEINEMANN, the publishers of the *Dudley Programs* (reviewed December 84), tell us that disc versions are now available. Theme Packs cost £36 + VAT and the Complete Suite, £195 + VAT. They are obtainable from Heinemann Education Books, The Windmill Press, Kingswood, Tadworth, Surrey KT20 6TG.

□LOCO Systems' (Modem review, February issue) phone number should have read 04862 4480.

□THE Fischertechnik Robot Kit is available from Artur Fischer UK, Fischer House, 25 Newtown Road, Marlow, Bucks. Tel: Marlow 72882/6.

□AN error appeared in the Quadline (January issue) disc notes. On page 67, the top of column three should read: "... and enter the following lines from listing 1: 10 to 200 inclusive, 250 to 360 inclusive ...". Also, line 6 of the listing in that column should read:

```
6 FOR L%=0 TO &1000 STEP 4
```

January's cassette contained the correct listings for Quadline. However they are saved under the author's name as ACTON1 and ACTON2. The former chains the latter in as Q2, which is never found. To use the programs correctly save them to disc or tape using the instructions provided in the article.

□JOE Telford's Ed-fax listing (January issue) contained an error in that the two semi-colons in line 900 look like colons. Line 900 should therefore read:

```
900 PRINTTAB(0,24);
STRINGS$(39," ");
```

Several of you were confused by the pixel editor. Before selecting the graphics mode, and while in alphabetic mode, select the desired colour of the graphics – ie CTRL-f7 for white, then press the Return key to move into the graphics mode. The QWASZX keys can then be used to generate, set and clear teletext pixels.

□ALSO in January, a minor error crept into Peter Sandford's colour fill routine (listing 4, page 117). In certain circumstances, this will cause the routine to leave a single pixel uncoloured when filling into an acute angle. This can easily be overcome by amending the following three lines:

```
4300 CMP &74:BNE
  notequal:CLC
4310 .notequal
4320 LDA xhi:SBC &75
```

These lines should be changed *after* the original listing has been entered and debugged, as they will invalidate the checksum test at line 90. This line should therefore be deleted before assembling the amended code.

□MALCOLM Banthorpe's Turtle program (February issue) contained a slight error. In line 470 the + sign should in fact be a − sign. This now means that you turn left when LEFT is entered rather than turning right in response to LEFT!

How to present programs and articles

FIRST read the 'Notes for Authors' on the contents page.

Your submission should be original and have a practical use. We receive many articles on subjects we have already covered – often quite recently.

A neat and clear presentation is very important. A few hours' thought about how your article looks, diagrams, applications and documentation will ensure that it is evaluated quickly and efficiently, and is more likely to be accepted.

Program presentation is also important. Follow the 'standard' we've adopted in the yellow pages. Most importantly, your program must run on Basic 1. The only exception is if the program is of a Basic 2 tutorial nature. Basic and illegal calls to routines in the MOS should not be used. Program lines should increment in steps of 10, with the first four being REMed as per the format in the yellow pages.

Program listings should not be indented, and avoid multi-statement lines.

Use the standard assembler presentation, one mnemonic per line, upper case mnemonics with lower case labels. If the assembler is long include a checksum.

Provide a list of PROCs, FN's and variables detailing the operation of each on a separate sheet of paper, along with any hints or tips regarding entering the program.

—IT'S UP TO YOU!—

READERS! This is your big chance to say how you would like to see *Acorn User* develop in the next year – and win some hardware into the bargain. What we want is to pick your brains to help us give you a better magazine. The answers you give will be compiled statistically, and your individual questionnaires will be kept confidential.

We want readers of all ages, sexes and opinions to tell us what they think. If younger readers have any problems, ask a friend, teacher or the rest of the family to help.

Just tick the box or boxes you think relevant and be as honest as possible.

Fill in your name and address, and give us your slogan idea to be entered for the prize draw. The two best slogans will win either a 6502 add-on, a Plus 3 or a bumper bundle of Atom hardware (editor's decision final!). Winners will be notified by post and their names printed in *Acorn User*. All forms must be in by Monday, March 18. Send them to Acorn User Survey, 68 Long Acre, London WC2E 9JH.

Name..

Address..

....**Post Code**..................

YOUR COMPUTER

1 Which micro(s) do you have?
☐ BBC micro model A ☐ Upgraded model A
☐ BBC micro model B ☐ Atom
☐ Electron Other ....

2 Where did you buy it?
☐ Acorn dealer ☐ Mail order
☐ WH Smith ☐ Boots
☐ Other High St store ....

3 How long have you had it?
☐ 0-3 months ☐ 3-6 months ☐ 6-12 months
☐ 1-2 years ☐ 2 years +

4 Has anything ever gone wrong with your micro?
☐ Yes ☐ No

5 If yes, how much did it cost to repair?
☐ Nothing, it was repaired by me/a friend
☐ Nothing, it was under guarantee
☐ It was covered by insurance/repair club
☐ 0-£25 ☐ £25+

6 If you have a BBC, which of the following do you have?
☐ Basic 1 ☐ OS 0.1 ☐ DFS
☐ Basic 2 ☐ OS 1.0 ☐ DNFS
☐ Econet ☐ OS 1.2 ☐ Don't know

7 If you have an Electron, do you have any add-ons?
☐ Plus 1 ☐ Joystick port
☐ Plus 2 ☐ Printer port
☐ Plus 3 ☐ ROM board
☐ Other ....

8 What other hardware do you have?
☐ Monitor ☐ 6502 second processor
☐ Disc drive ☐ Z80 second processor
☐ Printer ☐ Teletext adapter
☐ Joystick ☐ Modem
☐ Lightpen ☐ Graphics tablet
☐ Mouse ☐ Bitstik
☐ RAM board ☐ EPROM programmer
☐ ROM board ☐ Other ....

9 Where do you buy your hardware?
☐ WH Smith ☐ Software shop
☐ Boots ☐ Mail order through *Acorn User*
☐ Acorn dealer ☐ Other ....

10 What hardware do you hope to buy?
☐ Monitor ☐ 6502 second processor
☐ Disc drive ☐ Z80 second processor
☐ Printer ☐ Teletext adapter
☐ Joystick ☐ Modem
☐ Lightpen ☐ Graphics tablet
☐ Mouse ☐ Bitstik
☐ ROM board ☐ EPROM programmer
☐ RAM board ☐ Other ....

11 If you have a disc drive, what type is it?
☐ 40 track ☐ 5.25 inch
☐ 80 track ☐ 3 inch
☐ 40/80 switchable ☐ 3.5 inch
☐ Double density ☐ Don't know

12 If you have a disc drive, which DFS do you use?
☐ Acorn ☐ Pace ☐ Watford ☐ LVL ☐ Other

13 How much did your hardware system cost to buy?
☐ £201-£400 ☐ £401-£1000 ☐ £1001-£2000 ☐ £2000+

SOFTWARE

14 How many software packages do you have?
☐ 0-5 ☐ 6-10 ☐ 11-20 ☐ 21+

15 What proportion are games?
☐ 0-25% ☐ 26-50% ☐ 51-75% ☐ 75%+

16 How many packages do you expect to buy in the next 12 months?
☐ 0-5 ☐ 6-10 ☐ 11-20 ☐ 21+

17 Do you have any of the following software?
☐ Wordprocessor ☐ Basic toolkit
☐ Spreadsheet ☐ Machine code monitor
☐ Database ☐ Disc utilities
☐ Teletext emulator ☐ Communications

18 Where do you buy your software?
☐ High St chain ☐ Software shop
☐ Acorn dealer ☐ Mail order through *Acorn User*
☐ Other ....

19 How much did you spend on software in the last 12 months?
☐ 0-£20 ☐ £21-£50 ☐ £51-£100 ☐ £101-£500 ☐ £501+

20 In the next 12 months do you expect to spend
☐ More? ☐ Same? ☐ Less?

USER PROFILE

1 Are you ☐ male?
☐ female?

2 How old are you?
☐ 15 or younger ☐ 15-24 ☐ 25-34 ☐ 35-44
☐ 45-54 ☐ 55+

3 In which TV region do you live?
☐ London/South ☐ Yorkshire/Tyne Tees
☐ Anglia/Central ☐ Scottish
☐ HTV/South West ☐ Ulster
☐ Granada ☐ Channel

4 Number, in order of priority, the uses for your micro.
☐ Business ☐ Home administration
☐ Teaching ☐ Home education
☐ Industrial ☐ Wordprocessing
☐ Scientific ☐ Learning to program
☐ Games ☐ Adventures
☐ Communications ☐ Other ....

5 How much time in an average week do you spend at the micro?
☐ 0-5 hours ☐ 6-10 hours ☐ 10-15 hours ☐ 16+

6 Does anyone else use the micro?
☐ Family ☐ Schoolfriends
☐ Friends ☐ Work colleagues

7 If you have bought a micro, is it your first?
☐ Yes ☐ No

READER SURVEY

8 If you had the money again, would you buy the same micro?
☐ Yes ☐ No ☐ Possibly

9 Have you influenced anyone else to buy a micro?
☐ Yes ☐ No

10 Do you read the advertising in *Acorn User*?
☐ Most ☐ Some ☐ None

11 Have you ever had any problems with advertisers in *Acorn User*?
☐ Yes ☐ No

12 Do you belong to any of these?
☐ a computer club ☐ Micronet/Viewfax/Prestel
☐ electronic mail ☐ Oracle/Ceefax
☐ a repair club

13 Do you program in any of these languages?
☐ Basic ☐ Z80 assembler
☐ None ☐ 6502 assembler
☐ BCPL ☐ Pascal
☐ Forth ☐ Logo
☐ Other ....

14 Do you read any of the following regularly?
☐ Acorn User ☐ Personal Computer World
☐ A&B Computing ☐ Personal Computing Weekly
☐ Beebug ☐ Practical Computing
☐ E&CM ☐ The Micro User
☐ Elbug ☐ Video & Computer Games
☐ Electron User ☐ Which Computer?
☐ Home Computing Weekly ☐ Your Computer
☐ Personal Computer News
☐ Micro Futures in the Guardian
☐ Computer Horizons in The Times
☐ Computer Mail in the Daily Mail

ACORN USER

1 How do you get *Acorn User*?
☐ Subscription
☐ Buy regularly
☐ Have a newsagent order
☐ Read someone else's copy

2 How long have you read/bought *Acorn User*?
☐ 0-3 months ☐ 4-6 months ☐ 7-12 months ☐ 13+
☐ From the first issue

3 Have you had any problems buying *Acorn User* since December?
☐ Yes ☐ No

4 How did you find out about *Acorn User*?
☐ A friend ☐ Bought a copy
☐ Advertising ☐ Leaflet with computer
☐ Another magazine ☐ At Acorn User Show
☐ Other ....

5 Give marks out of 10 for the following features
☐ Contents ☐ Joe's Jottings
☐ News ☐ Yellow pages
☐ Noticeboard ☐ Beeb Forum
☐ Letters ☐ Atom Forum
☐ Dear Kitty ☐ Business News
☐ First Byte ☐ Business section
☐ Hints & Tips ☐ Education News
☐ High score table ☐ Education section
☐ Competition ☐ Top 20 software chart
☐ General articles ☐ Software reviews
☐ Comparative reviews ☐ Hardware reviews
☐ Diary ☐ Free ads

6 Which three of the above would you like to see less of?
....
....
....

7 Which three of the above would you like to see more of?
....
....
....

8 What are the three best articles you have read in *Acorn User*?
.... month.......... year..........
.... month.......... year..........
.... month.......... year..........

9 What are the three best programs you have typed in from *Acorn User*?
.... month.......... year..........
.... month.......... year..........
.... month.......... year..........

10 Which was the best front cover? ....

11 Who is your favourite author?
☐ Martin Phillips ☐ Joe Telford
☐ Bruce Smith ☐ George Hill
☐ Paul Beverley ☐ Tessie Revivis
☐ Other (please state) ....

12 How many listings do you type in each month?
☐ none ☐ some ☐ most ☐ all

13 Do you think the presentation of listings in the yellow pages of *Acorn User* is
☐ better than other magazines? ☐ worse than other magazines?
☐ about the same as other magazines?

14 If worse, which magazine does it best? ....

15 Do you get the monthly cassette to save typing in listings?
☐ Yes ☐ No

16 Would you take out a year's subscription to the monthly listings cassette?
☐ Yes ☐ No

17 Do you plan to buy a Bar Code Reader to save typing in listings?
☐ Yes ☐ No

18 Do you find it difficult to find your way around *Acorn User*?
☐ Yes ☐ No ☐ No worse than other mags

19 Did you go to any of these computer exhibitions?
☐ Acorn User Show 83 ☐ Acorn User Show 84
☐ PCW Show 84
☐ Hi-Technology in Education Exhibition 85
☐ BBC Micro User Show Westminster Winter 1984
☐ BBC Micro User Show Alexandra Palace Autumn 1984

20 What is the best time of year for a computer show?
☐ Spring ☐ Summer ☐ Autumn ☐ Winter
☐ School holidays

21 Would you go to smaller, local Acorn User Shows?
☐ Yes ☐ No ☐ Maybe

22 Rate in order of preference the following ideas for expanding the services *Acorn User* supplies:
☐ Pages of news on Micronet
☐ Listings on Micronet
☐ A bulletin board
☐ Phone enquiry service manned at weekends
☐ Fast reply service for enquiries
☐ Talks in local halls by authors
☐ Weekend courses organised by *Acorn User*
☐ Telecom Gold mailbox
☐ More *Acorn User* software

23 Do you use the function key strip which came free with last October's issue? ☐ Yes ☐ No

24 What do you love most about *Acorn User*? ....
....
....

25 What do you hate most? ....
....
....

26 Finally, to qualify for the prize draw, think up an advertising slogan for *Acorn User* in less than 15 words
....
....



Ultracalc 2 is supplied on a 16K Rom.

ULTRACALC 2

A powerful spreadsheet program for businessmen, scientists, accountants and everyone who needs ultra-fast calculations. It transforms your Model B computer into a fast and flexible calculation system.

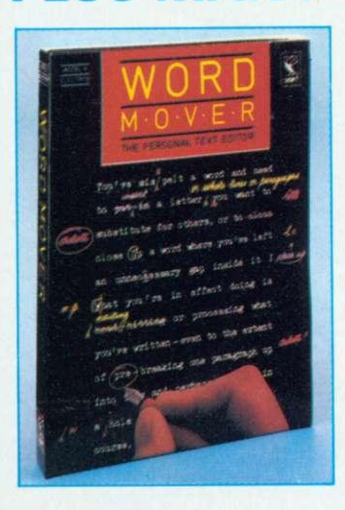
Use Ultracalc 2 for budgets, cash-flow forecasts and 'What if?' projections; for price lists, time sheets and stock control; for scientific calculations, or as a compact data-base. A full range of editing and display options enables you to adapt the spreadsheet to suit your needs.

Ultracalc's built in features include:–

- Simple communication with the program
- Wide choice of editing, display and printing options
- Output can be fed to a word processor
- Efficient memory usage, enabling large spreadsheets to be compiled
- Operates with 6502 second processor

If you already have Ultracalc you can upgrade it to Ultracalc 2 for only £6.25. Write for an application form to Software Editor, BBC Publications, 35 Marylebone High Street, London W1M 4AA, enclosing a stamped addressed envelope.

PLUS MANY MORE EXCITING PROGRAMS INCLUDING:



WORD MOVER

An ingenious program offering many of the features of a word processor–with none of the complications!

Cassette: £9.95



DRAWSTICK

A versatile design aid for children and adults. Use it for pictures, diagrams or as a CAD tool.

Cassette: £9.95



VU-TYPE PROFESSIONAL

An exciting, easy-to-use typing tutor with colourful graphics and Pitman-approved exercises to increase your speed and accuracy.

Disc: £21.95

All software is for the British Broadcasting Corporation Model B Microcomputer and is available from booksellers and computer shops. Prices include VAT.

BRITISH BROADCASTING SOFT CORPORATION


MD 400
£155.65
+ VAT= £179
MD 800
£312.17
+ VAT = £359
MD 800P
£373.04
+ VAT= £42
BBC Compatible
Mitsubishi Slimline Disc Drives
These are high capacity, precision drives with dynamic clamping and very low power consumption. All drives are supplied with cables, a very comprehensive utility/format disc and a manual.
MD 400 — 400K (800K double density) 40/80 track switchable double sided single drive.
MD 800 — 800K (1600K double density) independently 40/80 track switchable double sided dual drive.
MD 800P — 800K (1600K double density) independently 40/80 track switchable double sided dual drive unit with built-in power supply and monitor stand.
Opening Hours: Mon-Fri 9am-6.30pm
Sat 10am-5pm (ample parking)
We accept telephone orders on Barclay and Access Cards.
Mail Order: Cheques or bankers draft payable to Akhter Instruments.
Delivery free of charge (UK only)
AKHTER
COMPUTER GROUP
28/29 BURNT MILL, HARLOW, ESSEX CM20 2HU UK.
TEL. HARLOW (0279) 443521 TELEX 818894 AKHTER G
Dealer Enquiries Welcome

PRINTERS

ALL PRINTERS HAVE A 12 MONTH GUARANTEE

DOT MATRIX

KAGA TAXAN:

* Epson Compatible Control codes
* 80 or 156 Column
* NEAR LETTER QUALITY Print using 23 x 18 matrix
* Text Modes include Normal, Italic, Enlarged, Condensed, Super/Sub Script, Proportional
* Dot Addressable graphics in various modes
* 3K buffer which can also hold user defined characters
* Extra ROM/RAM socket for custom print fonts
* Friction & Tractor feed with built in paper roll holder

KP810 (80 column) **£255 (a)**
KP910 (156 column) **£359 (a)**

EPSON:

The industry standard printer offering the quality, reliability and versatility.

RX80T **£215 (a)** RX80FT **£225 (a)**
RX100 **£345 (a)** FX80 **£315 (a)** FX100 **£435 (a)**

DAISY WHEEL

BROTHER HR15: • 14 cps • 3K Buffer • Two colour printing • Proportional spacing • Underline • • Bold • Shadow print • Super/Sub script + many other features.

BROTHER HR15 **£340 (a)**

JUKI 6100: • 15 cps • 2K Buffer • Switchable 10/12/15 cpi • Proportional printing • Linear Motor for max reliability.

JUKI 6100 **£340 (a)**

ACORN VIEW PRINTER DRIVER GENERATOR

As well as coming with pre-defined drivers for printers including EPSON FX80, JUKI6100 etc, this generator enables you, by answering a few simple questions, to generate your own dedicated driver for almost any printer. The days of having to buy individual dedicated printer drivers are gone! **£10(d)**

EPSON HI-80 PLOTTER

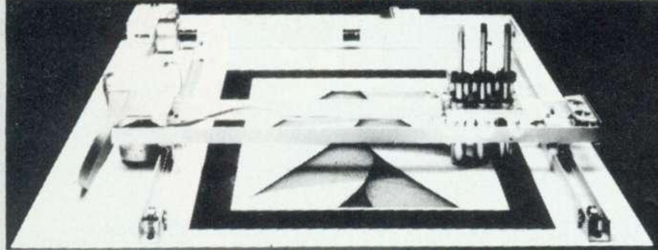
NEW

This new A4 size Epson plotter has many features and commands not present on plotters costing far more. Features include: 4 pens at same time — up to 10 colours, various types of pens, high plotting speed, can produce text in normal way as well as user defined characters, text can combine with graphics etc., etc. **£399(a)**

GRAPHICS PLOTTER/WORK STATION

Equally at home in the artists studio, hobbyists workshop, science lab or a classroom, this system has something to offer for everyone. The 3 colour graphics plotter provides both precision and versatility. The carriage can be moved with an accuracy of 0.025cm over an A4 area — the plotter being able to accept paper and far thicker materials at sizes of up to A3. The basic plotter carries 3 colour pens each of which is software selectable. Additional accessories greatly enhance the versatility of the unit without losing the accuracy. The servo controlled drill/router, and scriber can be used on various materials. A unique Opto Sensor (using a Hewlett Packard device) turns the plotter into a high-res scanning digitiser to read & store whole diagrams and photographs. Workstation comes complete all accessories.

Workstation Complete £490(a)



Basic Plotter **£270(a)** Opto Sensor **£72(c)**
Drill/Router Attachment **£79(c)**
Power Supply: PS12V **£42(c)** PS24V **£78(c)**
Scandump Utility Disc **£14.95(d)**

TECHNOMATIC

All prices exclude VAT

PRINTER ACCESSORIES

EPSON NEW

32K Internal Buffer Parallel **£75(b)**
Paper Roll Holder **£17(d)** FX80 Tractor Attachment **£37(c)**.
Interfaces: 8143 RS232 **£28(c)**; 8148 RS232 + 2K **£57(c)**;
8132 Apple II **£60(c)**; 8165 IEEE + Cable **£65(c)**.
Serial & Parallel Interfaces with larger buffers available.
Ribbons: RX/FX/MX80 **£5.00(d)**; RX/FX/MX 100 **£10(d)**;
FX80 Dustcover **£4.50(d)**

KAGA TAXAN: RS 232 Interface + 2K buffer **£65(c)**; Ribbon KP810/910 **£6(d)**

JUKI: RS232 Interface **£65(c)**; Spare Daisy Wheel **£14(d)**; Ribbon **£2.50(d)**;
Sheet Feeder **£129(a)** Tractor Feed Attach **£129(a)**

BROTHER HR15: Sheet Feeder **£199(a)**; **Ribbons Carbon or Nylon £4.50(a)**

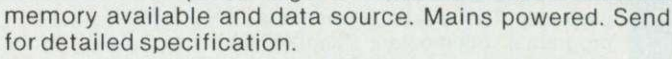
BBC Printer Lead: Parallel (42") **£7(d)**; Serial **£7(d)**
Printer Leads can be supplied to any other length.

Plain Fanfold Paper with extra fine perforation (Clean Edge):
2000 sheets 9.5" x 11" **£13(b)** 2000 sheets 14.5" x 11" **£18.50(b)**
Labels: 3½" x 1-7/16" in quantities of 1000
Single Row: **£5.25/1000 (d)**; Triple Row: **£5.00/1000 (d)**

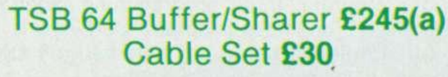
PRINTER SHARER/BUFFER

A unique sharer/buffer that provides a simple solution to improve system utilisation. it can be connected to up to three computers and it will automatically switch between the computers to scan for data — no manual switching required. High speed data input rate to the buffer cuts down the normal waiting time for the computers for the printing operation to complete and thus allowing the computers to be used for other uses. In networked systems it can eliminate the printer server unit. The 64K buffer would hold over 30 A4 pages of text.

Facilities include: COPY, PAUSE AND RESET. LED indication for percentage of



memory available and data source. Mains powered. Send for detailed specification.



TSB 64 Buffer/Sharer **£245(a)**
Cable Set **£30**

PERIPHERAL & COMPUTER SHARERS

We now offer an extended range of peripheral sharers to allow the user to switch between computers, printers and modems. High quality switching mechanisms housed in fully shielded metal cases ensure reliability. No power required.

Three Computers to one centronics printer (all 36 lines switched) **£65(b)**
Four Computers to one centronics printer (all 36 lines switched) **£79(b)**
Three Computers to one serial printer/modem (all 25 lines switched) **£59(b)**
Four Computers to one serial printer/modem **£69(b)**
BBC Cable Sets 3 way **£22(c)** 4 way **£27.50(c)**

Computer Sharer:
Allows one computer to be connected to two parallel printers fitted with cable for the BBC computer **£19.50(b)**.

GRAFPAD

A low cost graphic tablet offering the performance & durability required by industrial and educational users. It is compact, accurate & reliable; working area 240 x 192mm + menu area. Comes complete with a CAD package. **£110(b)**.

01-208 1177

Please add carriage: (a) £8; (b) £2.50; (c) £1.50; (d) £1 and VAT at 15% to order. Carriage (a) sent by Datapost

MONITORS

All monitors supplied with BBC lead

MICROVITEC

All 14" monitors now available in plastic or metal cases, please specify your requirement.

14" RGB		with PAL & Audio	
1431 Std Res	£165(a)	1431 AP Std Res	£210(a)
1451 Med Res	£240(a)	1451 AP Med Res	£280(a)
1441 Hi Res	£399(a)	These monitors can receive TV programs thru a Video Recorder	

20" RGB		with PAL & Audio	
2031 Std Res	£260(a)	2030CS Std Res	£380(a)
2040CS Hi Res	£570(a)	2040CS Hi Res	£685(a)

KAGA TAXAN 12" RGB

VISION II Hi Res £235(a) VISION III Super Hi Res £340(a)

SANYO CD3125NB 14" RGB Std Res £179(a)

MONOCHROME MONITORS:

SANYO DM8112CX Hi Res 12" Green Screen	£90(a)
KAGA KX1201G Hi Res 12" Etched Green Screen	£99(a)
KAGA KX1202A Hi Res 12" Etched Amber Screen	£105(a)
ZENITH 123 Hi Res 12" Green Screen	£68(a)
ZENITH 122 Hi Res 12" Amber Screen	£68(a)
Swivel Base for Kaga Monochrome fitted with Digital Clock	£21(c)
Monitor Plinth for the BBC	£13.50(b)
Double Tier Plinth for BBC and flat pack dual drive	£19.50(b)

BBC Leads Kaga RGB £5(d) Microvitec £3.50(d) Monochrome £3.50(d)

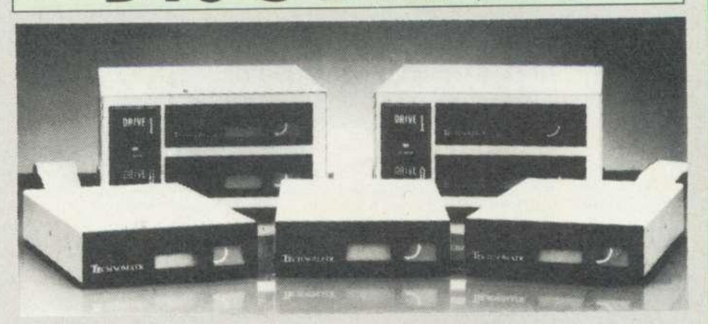
RB2 TRACKER BALL

Marconi with its years of experience making tracker balls for use in Military and Air Traffic Control have developed a quality device for the serious hobbyist, for educational uses, and for low cost CAD/CAM applications. RB2 is a compact, ergonomically designed tracker ball that provides precise positional control and rapid direction changing using a freely rotating resin ball in any direction without the limiting stops or the zero point drift of joystick controls. Three switch buttons enable easy software manipulation to incporate the use of the tracker ball. Appropriate software will enable the RB2 to take over the functions of cursor keys in word processing, CAD/CAM applications and two dimensional positional controls of robots, drillheads etc. RB2 which plugs into the user port is supplied with utility programme to use it as a joystick with other software, a comprehensive graphics/CAD program and a program demonstrating its editing capabilities. User guide includes instructions on writing your own programs for the RB2. £52(b)

AMX MOUSE – As seen on the BBC TV Micro progam

In conjunction with a controlling ROM this sophisticated mouse has many advanced features such as Icons, Windows etc., these can be used in ordinary programs as well as sophisticated CAD Design. The supplied 'AMX ART' is a superb, yet simple-to-use CAD package allowing the creation of amazing graphical designs. A screendump for drawings is included. It can also be used with Wordwise/View to replace the cursor keys. Supplied complete with CAD Package, ROM and full instruction manual. £75(b)

DISC DRIVES



TECHNOMATIC disc drives come fitted with high quality slimline Japanese mechanisms and represent the state of art in disc drive technology. They are built to highest standards and are all tested to their full performance capability before packaging. Single drives are offered with or without integral power supply whilst the dual drives are supplied with generously rated switch mode power supply. Attractively designed steel casings are painted in hard wearing BBC matching paint. All drives can operate in single and double density modes. Drives are supplied with cables, manual and formatting disc and are ready to be fitted to the computer.

Single Drives

1 × 100K 40T SS : TS55A £100(b); CS55A with psu £125(b)
1 × 200K 40/80TSS : TS55E £140(b); CS55E with psu £150(b)
1 × 200K 40TDS £115(a)
1 × 400K 40/80TDS : TS55F £145(a); CS55F with psu £169(b)

Dual Drives

2 × 100K 40T SS: TD55A with psu £250(a)
2 × 200K 40/80T SS: TD55E with psu £325(a)
2 × 400K 40/80T DS: TD55M with psu £350(a).
2 × 400K 40/80T DS: TD55MP in flat pack with built-in plinth £365(a)

DISC DRIVE MULTIPLEXER

A simple device that enables up to four computers to be connected to one single or dual drive. Ideal unit for installing in classrooms where networking is not planned or necessary or the costs have to be kept low or where software information is shared. Several of these units can be installed in series to connect more computers to access the same discs. Units supplied with 5' of cable per outlet as standard. Mains powered.

Write for full details.

TDM 4 Quad Unit (upto 4 computers) £135(a)
TDM 2 Dual Unit (2 computers) £75(b)

Note: All computers must be fitted with a DFS

3M FLOPPY DISCS

Authorised Distributor Data Recording Products

Industry standard high quality discs with guaranteed error free performance for life. £1 Wine Voucher with purchases of every 20 discs only until voucher stocks last.

Discs in packs of 10:

40T SSDD £15(c) **40 T DSDD £18(c)**
80 T SSDD £22(c) **80 T DSDD £24(c)**



DISC ACCESSORIES

Single Disc Cable £6(d) Dual Disc Cable £8.50(d)
10 Disc Library Case £1.80(d) 30 Disc Case £6.00(c)
Lockable Storage Boxes 30/40 Discs £14(c) 100 Discs £19(c)

The FLOPPICLENE disc head cleaning kit is the ideal way to ensure the optimum performance of your drives. The use of disposable cleaning discs eliminate the risk of recontamination and abrasion of the sensitive disc heads and ensure continuously reliable data capture and transmission.

Floppiclene with 20 disposable cleaning discs. £14.50(b).

COMMUNICATIONS

MODEMS

ACORN PRESTEL: The official Acorn add-on — an advanced BT Approved. Auto-Dial, Prestel Terminal ideal for British Telecom Gold. Comprehensive software includes 'tagged' frames, downloading of Telesoftware, saving of frames, printing, sophisticated 'Mailbox' handling c/w editor. A built-in speaker allows line monitoring. A simple !BOOT file allows automatic operation £106(b)

BUZZ BOX A full spec, BT approved, pocket size, direct connect modem with both originate & answer modes, full & half duplex, allowing access to many databases, bulletin-boards as well as intercomputer communications. It conforms to CCITT V21 300/300 Baud Standard. Battery/mains powered £55(c) BBC Lead £6 External PSU £9(c)

MINOR MIRACLES WS2000 A world standard modem, having BT approval, covering V21,V23,BELL 103/113/108 and including 75,300,600,1200 Baud ratings. (It even includes 'reverse Prestel'!). This is the modem that will cover 'Prestel' type systems as well as Bulletin Boards both in the UK and abroad. What possibly gives this modem its biggest advantage is its option of computer control. A 25Way RS232 input as well as possible computer controlled auto-dial/auto-answer makes this modem unique. WS2000 £129(c) BBC Serial Cable £7



WS2000 Auto-Dial card: includes an integral loudspeaker for monitoring of the phone line £30(d). BBC User Port cable (for modem control) £7. **SKI KIT** (Allowing total control of the modem by your computer) £10. **DS1 Disc (for Commstar):** When used with the Auto-dial card, SK1 Kit, and a user port cable, this software will dial out to Prestel, enter your password etc. and leave you in Commstar. Will also store many bulletin board telephone numbers for autodialling £10.

WS2000 Auto-Answer Card £30(d).

UNICOM A High Performance, yet low-cost Modem. Features include: Auto-dial & auto-answer, Auto baud rate scan, 75,300,1200 Baud rates with V21, V23 and Bell standards. Sophisticated software in ROM allow many features like: Auto-Dial. Redial, Remote facilities etc. An Auto-Dial disc allows storage of commonly dialled numbers. UNICOM £49.95(b) Unicom ROM £20 Unicom Disc £9.95 Unicom Cable £6(d) Not BT approved

TELEMOD-2 A BT approved modem complying with CCITT V23 1200/75 Duplex & 1200/1200 Half-Duplex standard, that allows communication with Viewdate services e.g. Prestel, Micronet etc., as well as using 1200 Baud for communicating with other computer users. Mains powered. TELEMOD 2 £50(b) BBC Lead £7.00

COMMSTAR An ideal communications Rom. Extremely easy to use, yet very versatile. It features both a Prestel mode as well as a Terminal mode, thus offering very good value for money. In Prestel mode, all normal Prestel features are available including, downloading of software, saving and retrieving of pages on disc, page tag, revealing of hidden text etc. Its terminal mode is ideal for bulletin boards etc. All input may be copied into a buffer in memory over which full control is available. Controls of protocols are very simple and any type of file, (not just ASCII) may be sent using XModem protocols. Even includes an elapsed time-clock. £29(d)

TERMI-II A good all round package for communicating with notice boards, electronic mail services etc. Termi is a semi-intelligent terminal emulator allowing the BBC to act as a dumb terminal, slave BBC graphics terminal, or VT52 terminal. The rates at which data is sent or received is easily set up with rates of up to 4800 Baud with 40/80 col. selectable. Allows files to be transmitted from disc, or a copy of incoming data to be sent to a file or to a printer. (Termi is not suitable for PRESTEL). £28(d)

COMMUNICATOR This is a full 80 col VT100 terminal emulation program on 16K eprom. It is a more advanced program than TERMI and features easy to follow screen menus. The rate at which data is sent or received is easily set up with rates up to 19200 Baud with 80 column text. Allows files to be transmitted from disc, or a copy of incoming data to be sent to a file or to a printer. (Communicator is not suitable for PRESTEL). £59(d).

TECHNOMATIC

All prices exclude VAT

EPROMER II



This enhanced eprom programmer will handle the full range of popular single rail eproms. Its sophisticated menu driven software makes the programming of eproms simple and efficient. Features included in this programmer are normally found in industrial grade programmers costing many times more.

- Interfaces with the BBC through 1 Mhz bus. Fully buffered and complies with the ACORN protocols. Integral power supply ensures no power drain from the computer.
- All eproms up to 16K programmable in single pass.
- User friendly software driven menu provides total control from the keyboard — no knobs to fiddle with.
- Selectable programming voltage — 25/21/12.5V.
- Defaults to normal programming — high speed algorithmic programming selectable.
- READ/BLANK CHECK/PROGRAM/VERIFY at any address or addresses.
- Constant display of all options selected.
- Full screen editor with HEX/ASCII input — Full TAPE/DISC filing facility.
- Data entry from the keyboard, disc/tape or another eprom.
- Several BBC BASIC programs can be entered on one eprom.

EPROMER II with manual & cassette £99(b) Software on: Disc £3

UV ERASERS

UVT1T Eraser with built-in timer and mains indicator. Built-in safety interlock to avoid accidental exposure to the harmful UV rays. It can handle up to 5 eproms at a time with an average erasing time of about 20 mins. £59(b).
UV1 as above but without the timer. £47(b).
For Industrial Users, we offer UV140 and UV141 erasers with handling capacity of 14 eproms. UV141 has a built in timer. Both offer full built in safety features UV140 £61; UV141 £79(b).

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RAMROM-15

The advanced sideways ROM/RAM expansion system. This is an external unit, using high quality construction, attractively packaged in a BBC coloured metal case, allowing easy access to all the sockets. (Allows other units to be fitted inside the BBC). Absolutely no soldering is required. Allows 11/12 additional sideways ROMs to be fitted with an option of up to 16K sideways RAM. All commonly available RAM can be used i.e. 4801/6116/6264 or xx128. All the hardware to take the RAM is already fitted e.g. battery backup. For development work and further expansion, most of the 6502 processor signals are available. Supplied with utility disc and full instruction manual. £112(b)

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ATPL SIDEWISE ROM EXPANSION BOARD

This is a well constructed expansion board that does not require soldering in its installation. All buses are buffered. It allows full sideways Rom expansion to a total of 16 ROMs. One socket has been split into two 8K sockets to allow the use of 8K byte CMOS RAM chips, giving a total of 16K sideways RAM. This is ideal for sideways rom development, and will also allow downloading of software from cassette or disc. The battery backup option will allow retention of data in the RAM, when power to the computer is removed. Several link-selectable options include the choice of type of Eprom, and a 'write-protect' for the RAM option. £39(d) Back-up Kit £18.

ACORN IEEE INTERFACE

This interface enables a BBC computer to control any scientific and technical equipment that conforms to the IEEE488 standard, at a lower price than other systems, but without sacrificing any aspect of the standard. The interface can link up to 14 separate IEEE compatible devices. Typical applications are in experimental work in academic and industrial laboratories, with the advantage of speed, accuracy and repeatability. The interface is mains powered and comes with cables, IEEEFS ROM, and user guide. £282(a)

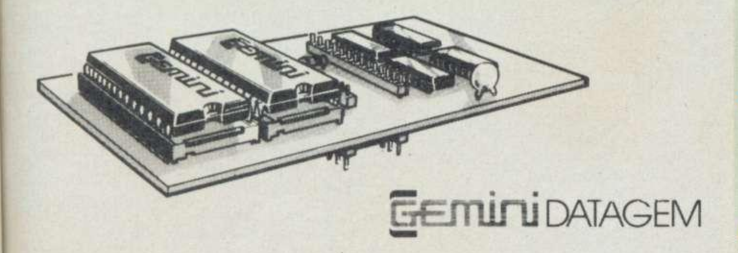
ACORN TELETEXT INTERFACE

This interface allows the retrieval and storage of data transmitted by both BBC and IBA. There are currently many educational and other programs being transmitted, and this unit will allow their retrieval absolutely free. In 'Terminal' mode, the system receives and decodes pages from both Ceefax and Oracle. (These pages can be stored). In 'Telesoftware' mode, the system can load, run and execute programs that are transmitted. This unit gives you a professional teletext terminal at a cost effective price. £195(b)

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Convert your BBC micro into a sophisticated music composition aid and sound effects generator. Custom made software will provide you with the flexibility to compose, experiment, perform and teach music. Stereo output can be connected to a sound system including your home stereo unit. Full specification on request. £174(a)

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Datagem is the first truly flexible database for the BBC Micro that can make your system really useful and efficient, saving you money in the long run. The system includes a carrier board containing two Eproms, demonstration applications disc in both 40/80T, professional documentation with quick reference card, and 'Trans' utility program. Features include: *almost unlimited file size (max 10MByte) *supports up to 4 drives *Max of 5000 records per file *max 6K record size *max of 62 fields *9 level hierarchical search system with facilities to store results of searches. Searches can be any one of the following: Search, Include, Exclude, Combine, Common or Difference *user defined variables *generates form letters from records. Please ask for leaflet. £112(c).

STARdataBASE A fast machine code, true random access database program in a 16K Eprom. Up to 4096 records in a file, up to 69 fields in a record. The record layout is totally user defined. Entirely menu driven — thus very user friendly. Extremely fast searches are possible using the Keysearch facility. Mailmerging from View and Wordwise, and address labelling. Its printer configuration suits any BBC compatible printer. £75(d)

ROMs/SOFTWARE

VIEW Acorn's new version V2.1 word processor rom. Advantages include printing straight from memory and editing in any mode. £48(c)

HI VIEW Disc based version of VIEW word processor for use with the 6502 2nd processor. Allows 47K of user memory. £52(c)

VIEW INDEX Disc based program to create an index from VIEW text files. Ideal for anyone concerned with writing extensive reports or books. £13(d)

WORDWISE One of the most popular word processors for general use. Wordwise SpellCheck Disc — A must for any serious word processor user. Normal price £16.50(d). If bought with Wordwise: No p&p and only £14.

WORDWISE PLUS The new advanced Wordwise on a 16K eprom, for the more specialised users who require added features and flexibility. New facilities include: 2nd Processor compatible allowing 80 column previewing in all cases, a new Basic-like language, new editing features and embedded commands etc etc. Four new programs are also supplied allowing mail-merging, index generating, two-column text printout and continuous processing. A new 56 page introductory manual and a 180 page reference manual complete this rather special package. Finally, it is able to use existing Wordwise files without any modification. £49(d).

SPELLCHECK II: A rom based fast machine code program that works with both VIEW and WORDWISE. Vocabulary disc supplied with 6000 words can be expanded to well over 17000 words on 100K drive. Fully compatible with 6502 second processor. £26(d)

ISO-PASCAL: Acorn's full implementation of International Standard Pascal on two 16K ROMs. Disc Version for use on 6502 2nd Processor also supplied. Comprehensive manual. £60(c)

ACORN LOGO A full implementation of the Logo language from Acornsoft. Supplied as two ROMs with a tutorial course and technical manual. £60(b)

ULTRACALC This enhanced version of the original BBC Publications popular spreadsheet rom includes many new features including full compatability with the 6502 2nd processor running as HiCalc allowing 44K of user memory, operate in any mode, greater flexibility in printer control, spooling as ASCII file etc. All these features are in addition to the existing powerful features such as handling of labels and numbers as values. Column width control and features normality found in well designed spreadsheets. £69(d)

VIEWSHEET Acorn's spreadsheet provides 255 columns and 255 rows and will operate in any mode. Windows can be created which can then be rearranged to provide any print format required. Function keys provide for easy entry of commands. Printer control codes can be used using the printer driver. Fully compatible with VIEW and the 6502 2nd Processor. £52(d)

BCPL A full implementation of the BCPL compiler language consisting of the language rom, disc containing the BCPL compiler, a screen editor, a 6502 assembler, other utilities and programming aids and examples of BCPL code and a 450 page manual. BCPL can be used to develop games programs, commercial packages, system software, to write control systems and to produce programs which otherwise would need to be written in assembler. £52(b)

BCPL STAND ALONE GENERATOR Utilities in this package enable the programs developed using the BCPL rom to be converted so that they can be run on any BBC micro whether it has a BCPL rom or not. Stand alone programs for other 6502 based systems can also be developed. £43(d)

BCPL CALCULATIONS PACKAGE: supplied on disc, it supports floating point, fixed point and fast integer calculations. It includes the BCPL calculation files, example files and a comprehensive user guide. £17.30(b)

ACORN LISP Rom £43(d)

G:FORTH An advanced implementation of FORTH which follows the 79-Standard specification on a 16K ROM and has a full double number extension set. It incorporates an editor, 6502 assembler, very fast turtle graphics and supports extensive string and file handling. It contains 540 predefined words including those for reading joystick ports, produce sounds, set and read the time and produce random numbers. Fully compatible with disc or tape filing systems and works in any mode. Package comes complete with a USER GUIDE, Introduction to FORTH and 16K GFORTH ROM £43(d)

DISC DOCTOR Computer Concept's popular disc utility rom which adds 20 commands to the DFS system. £27(d)

DISCMASTER Beebug's a disc utility rom which provides additional DFS commands and utilities including disc menu to automatically RUN/*RUN programs, converting 40 track discs to 80 track and enable dual catalog. £16(d)

EXMON II Updated version of the EXMON rom with facilities including dual screen operation and full screen memory editor. £24(d)

TOOLKIT This ROM adds 27 new commands to the BBC BASIC. These include a full screen editor, merge, relocating data in memory, program compactor, listing of variables and memory search. £23(d).

SLEUTH A debugging tool for BASIC programs which includes features like single stepping of dual screen programs, and accelerator to run programs from full speed to freeze frames. £24(d)

GRAPHICS ROM Adds 28 new graphic related commands and features include sprites, turtle graphics, rotation, scaling, 3D plotting all using "*" commands. £27(d)

PRINTMASTER This ROM features the most versatile screen dump for EPSON MX/RX/FX80 and Kaga 810 printers. It supports three types of dumps. The first allows any graphics on the screen to be dumped. Colours appear as shades of grey. Any part of the screen can be printed at any position on the paper in any one of four orientations. The screen dump may be magnified by any factor x2, x3, x4 etc. A special feature allows true MODE 7 screen dumps with TELETEXT text & graphics. The second dump allows any text to be dumped whilst the third dump will print the contents of a file on disc whilst the computer is doing other things. This is not all. All printer functions can be called up using the *command. *DEFINE allows the printer to define his own characters and store them. *GPRINT allows printing of enlarged text in any position, orientation, size & shade. *WINDOW allows windows to be defined in any size and position on the screen. Can allow you to do printing as background oepration while the computer does other jobs. **In short this one ROM does it all.** £28(d)

DUMPMASTER Disc based program that produces fast machine code routines for a variety of printers incl. EPSON MX/FX, STAR 910, Seikosha, NEC PC8023, INTEGREX 132A. Dumps in 8 shades in any mode including teletext mode. Snapshot facility allows dumps from games and other programs. £10(d)

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BILLBOARD A useful program that enables your BBC to produce super-large 'Billboard' type characters i.e. a continuous horizontal scrolling of super-large characters. Supplied in ROM. £16.50(d).

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DESIGN Design is a second processor which allows information to be displayed in a format suitable for demonstrations, slide projections, handouts or presentations. Graphs, Pie Charts & Bar Charts are quickly produced; automatically drawn & scaled. Versatile labelling facility, 25 User defined, 4 large macro characters plus screen dump facilities included. £16.50(d) Disc (80 or 40 Track).

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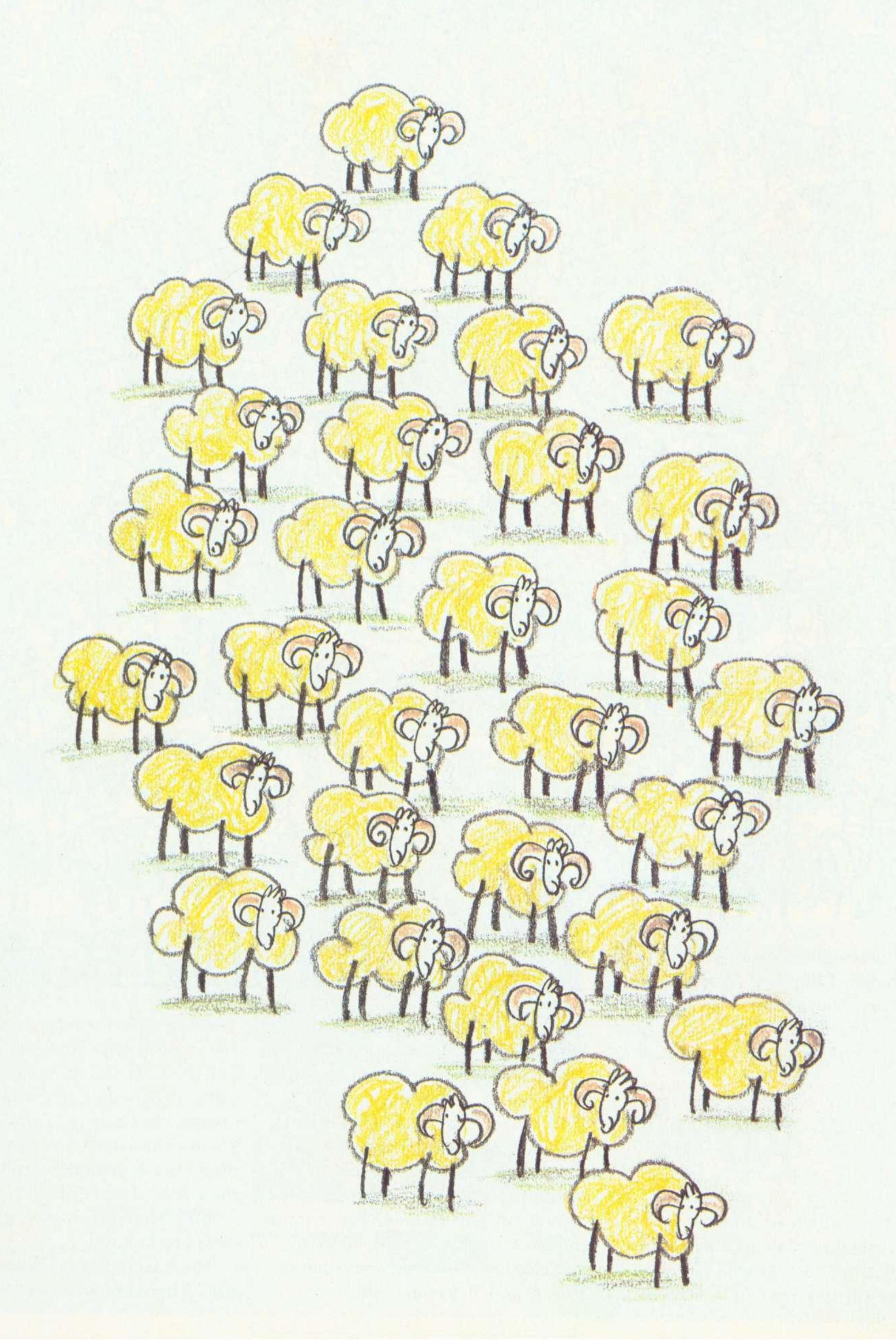
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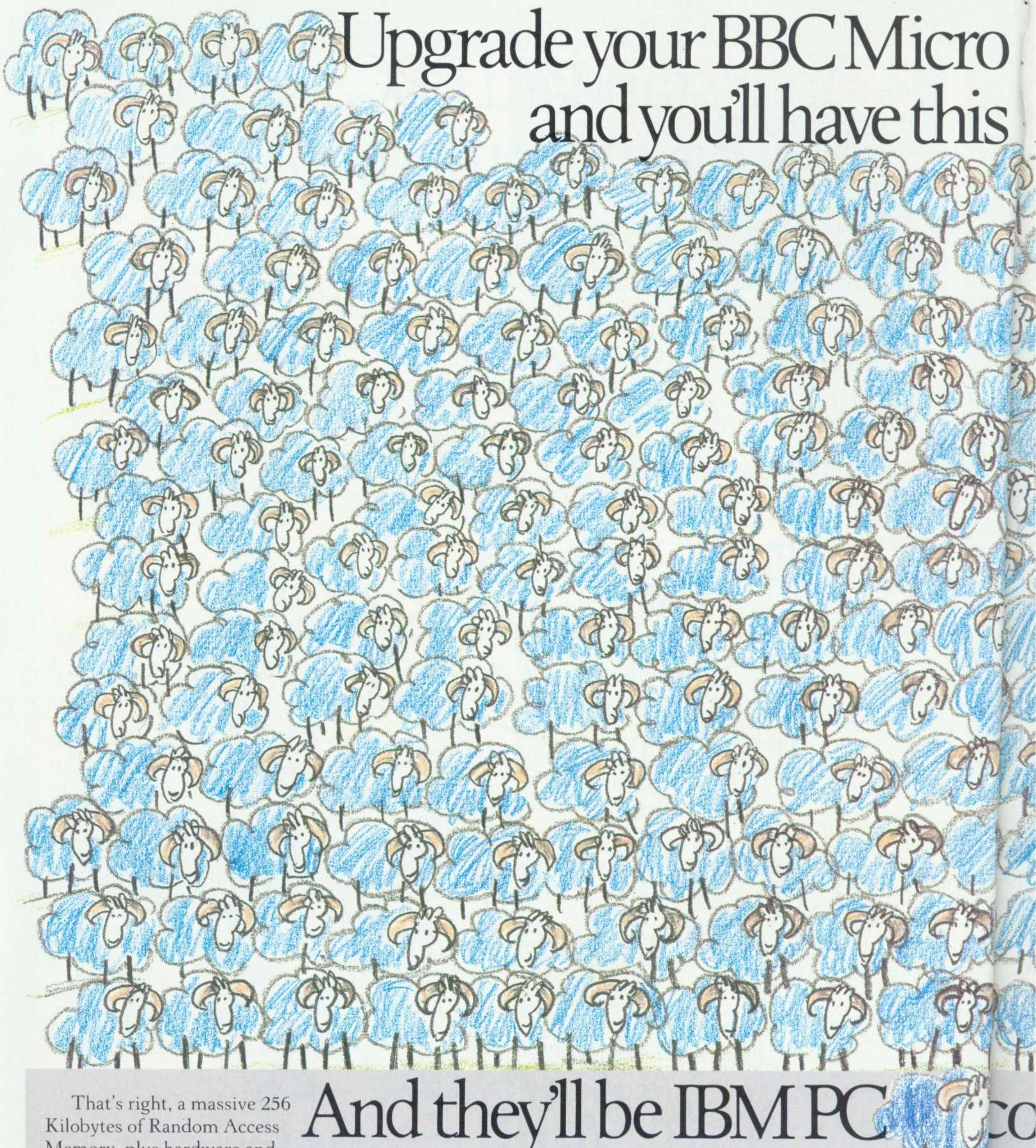
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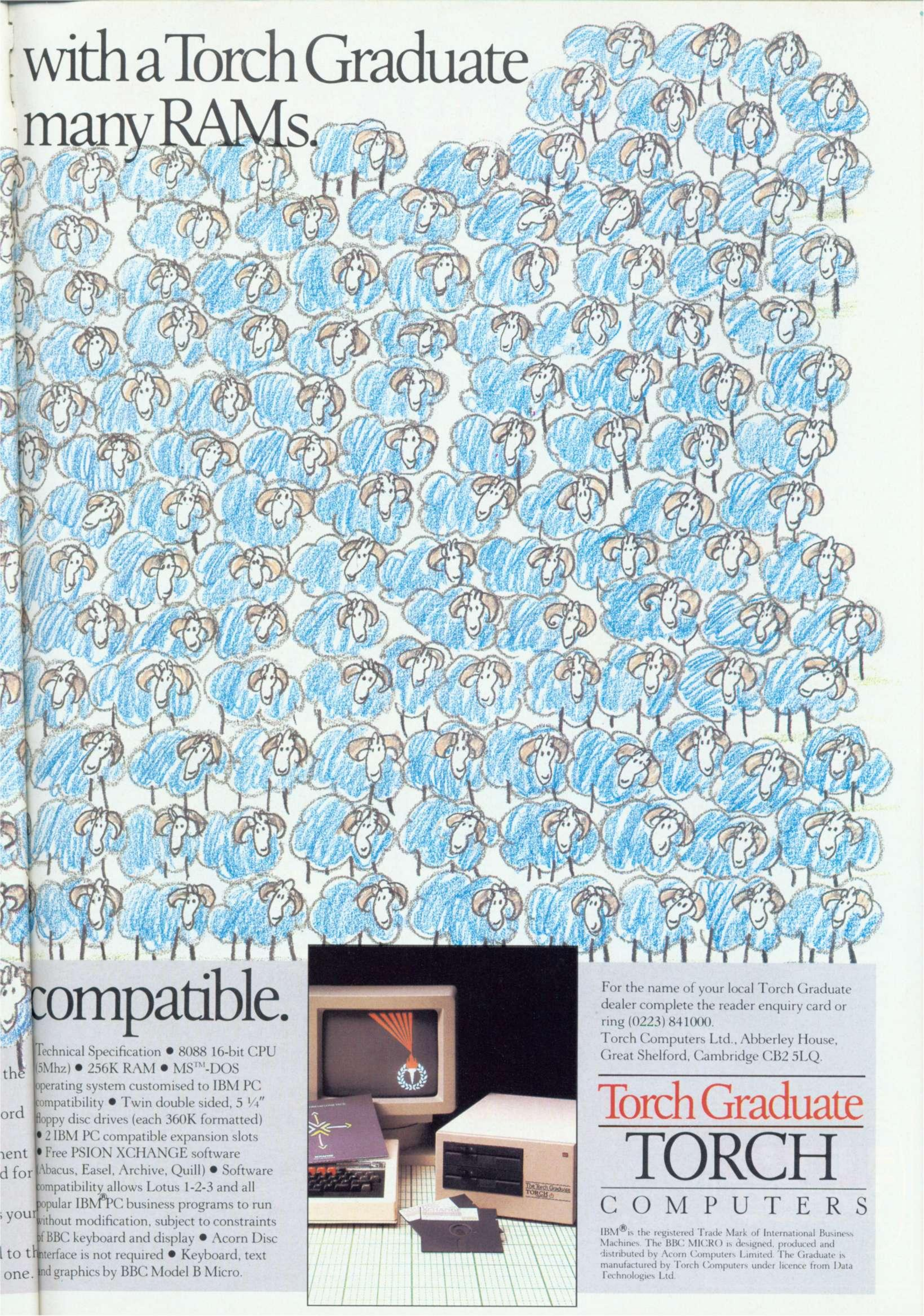
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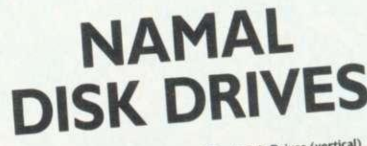
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Chesterfield. 0246 203519
Sheffield. 0742 78333
Northampton. 0604 22573
Peterborough. 0733 65352
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Chester. 0244 28421
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Birmingham. 021-643 7582/3/4
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Basildon. 0268 21816
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Watford Electronics



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SPECIAL OFFER

BBC Micro 'B' Only: £315

Price includes FREE 5 games software packages



BBC MICRO 32K + 32K

(includes extra 32K RAM card already fitted)

Only: **£379**

6502 2nd PROCESSOR	**£175**
Z80 2nd PROCESSOR	**£339**

TORCH Z80 DISC Pack	**£695**
TORCH Z80 2nd Processor	ONLY **£295**

(Securicor carriage on Micros £7)

BBC Micro with ECONET	**£375**
ECONET Upgrade Kit	**£55**
File Server Level 1	**£85**
File Server Level 2	**£215**
Printer Server EPROM	**£41**
Terminators (Pair)	**£60**
Clock with PSU	**£35**
10 Station Lead Set	**£25**
ECONET User Guide and Cable	**£10**
TELETEXT Adaptor	**£195**
Acorn Bitstick	**£328**

Dust Cover for BBC Micro

Protects your expensive Micro from foreign bodies while not in use. **£3.50**

PRINTERS

- EPSON RX80 Printer **£209**
- EPSON RX80 F/T Printer **£219**
- EPSON FX80 Printer **£316**
- EPSON FX 100 Printer **£429**
- SEIKOSHA GP100A **£122**
- Centronics PRINTER CABLE for all the above printers to interface with the BBC Micro. **£7**

(Securicor carriage charge on printers £7)

RX & FX PRINTER INTERFACES

Epson interfaces fit inside the printer to allow connection using techniques other than Centronics.

RS232	**£35**	RS232 + 2K Buffer	**£59**
IEEE 488	**£65**	2K Parallel	**£58**

COLOURJET PRINTER

Integrex 36 Colour Ink jet printer. Prints in all modes incl. mode 7. Prints overhead transparencies. Centronics parallel interface. 40 CPS in full colour. 640 dots/line + 1280 dots/line high res mode. Double strike mode. 84 dots/inch both axis. Friction feed rollpaper with single sheet feed A4. Virtually silent. FREE BBC dump listing.

Introductory Offer: **£525**

Type	Ribbons	Dust Covers
MX100/FX100	**£10.00**	**£5.25**
FX80/MX80	**£4.75**	**£4.95**
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4 COLOUR PLOTTER PRINTER

SAKATA SCP-800 printer/plotter facilitates plotting & printing in 4 colours on paper upto A4 size, using easily replaced pens. In text mode it prints upto 12 CPS. Max 160 Char. per line. In graphics mode it offers full plotting facilities incl. drawing, moving, scaling of text, rotation & drawing of axes. (Write for a sample printout).

Only £175

(Our COLOUR DUMP ROM worth £22 supplied ABSOLUTELY FREE with every plotter purchased during this month).

PRINTER SHARER

Allows 3 BBC Micros to be connected to one Printer.

Only: £65

BROTHER HR-15
DAISY-WHEEL PRINTER

Brother HR15 is a high-quality daisy-wheel ideal for a budget printer for serious use. Notable features of this printer include a 3k buffer, 18cps (max), bi-directional printing, proportional spacing, Centronics or RS232 interfaces as standard, optional sheet feeder and an optional keyboard.

ONLY **£329** (carr. £7)

Single Sheet Feeder	**£195**
Electronic KEYBOARD	**£135**
TRACTOR FEED Attachment	**£90**

RIBBON CARTRIDGES:
Fabric **£3.75**; Carbon **£3.75**; Multistrike **£6**

DAISYWHEELS (various typefaces) **£18**

Listing Paper (Plain)

1,000 Sheets 9½" Fanfold Paper	**£7**
2,000 Sheets 9½" Fanfold Paper	**£13**
1,000 Sheets 15" Fanfold Paper	**£9**
Teleprinter Roll (Econo paper)	**£4**

Carriage on 1,000 Sheets £1.50

PRINTER LABELS
(On continuous fanfold backing sheet)

1,000 90×36mm	**£5.50**
1,000 90×49mm	**£7.75**
1,000 102×36mm	**£6.25**

Carriage on Printer Paper or Labels £1.50
Carriage on 1,000 Labels £1.00

All prices exclude VAT

SPECIAL OFFER

HITACHI EPROMs for Sideways ROMs
2764-250nS £4.25
27128-250nS £9.75

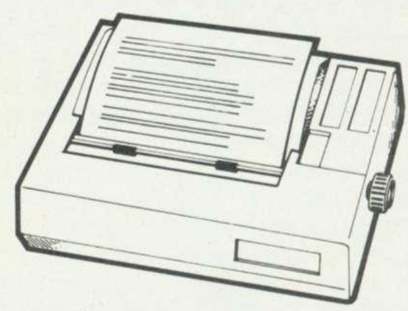
RAMs (Low power) for ATPL, WATFORD, etc., Sideways ROM Boards
6116LP (2K) £3.25
6264LP (8K) £9.95

FIRMWARE

ACORN 1.2 DNFS ROM	**£15.00**
ACORN 1.2 OS ROM	**£10.00**
ACORN BASIC 2	**£30.00**

(Maximum of 5 ROMs or RAMs of any one type per order). Dealers inquiry welcome.

KAGA KP810



This new Japanese printer has EPSON FX/RX compatible control codes and is functionally equivalent to an FX80 with the added advantage of its 'Near Letter Quality' mode. It is solidly built and features include: Normal, Italic, Enlarged, super/subscript, proportional spacing and user-defined character set. Extras over the FX80 included in the price are Near Letter Quality (NLQ) print ideal for correspondence, Proper adjustable tractor feed, half speed quiet mode and 3K buffer. The printer is bi-directional and logic seeking to give a speed of 140CPS for high throughput in conjunction with the standard 3K buffer. 8K RAM may be added to give more user-defined character sets. Centronics parallel interface + Watford's 12 month NO QUIBBLE WARRANTY.

Special Offer: ONLY **£249** (£7 carr.)

RS232 interface + 2K buffer to connect to other micros. **£89**

KAGA KP910 Printer

Similar to the KP810 but with 17" carriage for wide print. Gives 156 columns of normal print or 256 columns in condensed mode. Ideal for printing out spreadsheets.

ONLY **£339** (£7 carr.)

PRINTER LEAD

Centronics lead to connect BBC micro to EPSON, KAGA, SEIKOSHA, NEC, STAR, JUKI, BROTHER, SHINWA etc. printers.

Standard length (4 feet long)	**£7**
Extra long (6 feet long)	**£9**

3M - 5¼" DISKETTES

Top quality 3M – SCOTCH Diskettes from Watford Electronics (Your 3M Appointed Distributors). All discs carry a lifetime warranty. These discs are quiet in operation and insert positively with their reinforced hub rings. Boxes of 10 supplied complete with self stick, disc labels and write protect tabs.

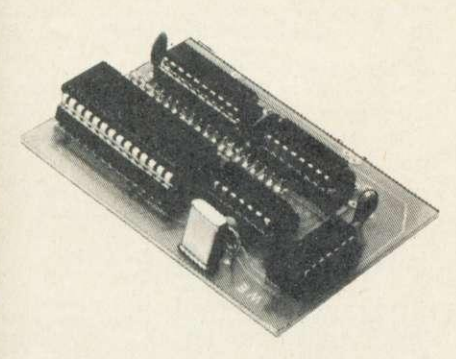
DON'T SETTLE FOR LESS, BUY THE BEST

- 10 S/S D/D 40 Track Diskettes **£14**
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ACCESS HOT LINE (0923 50234) 24 Hours

DOUBLE DENSITY
DISC INTERFACE



SIMPLE but SOPHISTICATED

We are proud to bring to you the Watford Electronics Double Density Board for the BBC Micro.
The DDFS supplied is a new version of the popular Watford Electronics DFS re-written to make full use of the capabilities of the new double density controller.

- Increases storage capacity of your Disc Drives by the maximum physically possible, 80% !!!
- Our system will use the whole of an 80 track drive. Inferior systems do not allow files longer than &3FFFF bytes, but with our system files can be as long as one disc side.
- Discs may be created in either single or double density format with the built in formatter and in single density mode are fully compatible with normal Acorn format discs.
- The density of the disc you put in is automatically sensed by the system and you are informed of the density in the catalogue display.
- The double density system is of course faster than single density.

The Watford Electronics DDFS implements an extremely comprehensive 8271 emulator so that commands passed through OSWORD & 7F are correctly interpreted. Other manufacturers thought that read and write sector alone were sufficient – we decided to implement every command of the 8271 that was physically possible. We have allowed the use of all the special registers including bad tracks, allowed access to deleted data etc., etc. The emulator itself takes up around 1K of compactly written machine code. We reckon it will run many of the protected discs now available. Gain all the advantages of the WE DFS together with much increased storage and compatibility with many existing protected discs.
(please write-in for full technical specifications)

Complete Unit incl. DDFS ROM **£85**
DDFS Manual **£6.95** (no VAT)
We will exchange your existing Single Density Interface for our DDFS Unit for **£49**
(Carriage £1.50)

THE ULTIMATE DFS

Watford are proud to be able to supply both SINGLE and DOUBLE DENSITY versions of their highly acclaimed Acorn compatible DISC FILING SYSTEM.
Single Density DFS runs Acornsoft's ELITE.

What do the independent press say?
"Good value for money" – Beebug
"A very worthwhile package" – The Micro User
"You'll be buying a very powerful package" – Personal Computer News
"Superior DFS; Excellent disc sector editor" – Computer Answers

Without a doubt the most sophisticated DFS software yet written for the BBC microcomputer. This powerful DFS is fully compatible with the ACORN DFS, yet has much increased power due to the additions, carefully designed to make life easier in normal use. It consists of 16K of efficiently written machine code. It is entirely self contained and so does not require a utilities disc to function.

SPECIAL OFFER

- DFS (Disc Filing System) ROM only **£18**
- Complete Disc Interface Kit Incl. DFS ROM & fitting instructions .. **£89**
- Acorn's DFS Kit complete **£86**
- DFS Manual (comprehensive) **£7**
- We will exchange your existing Acorn DFS for Watford's ULTIMATE DFS for . **£14**

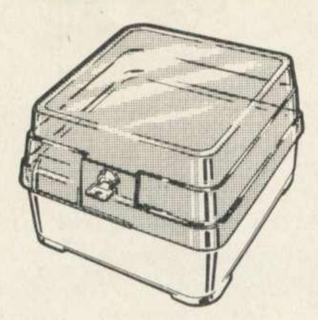
P.S.
We will exchange your existing ACORN DFS for Watford's highly sophisticated DFS ROM for .... **Only: £18**

Watford's DFS is exclusively available from Watford Electronics. We DO NOT retail this product through dealers. Every ROM carries a printed label with our LOGO and a serial number.

THE FEATURES OF WATFORD'S SINGLE & DOUBLE DENSITY DFS.

- The system can either use the ACORN standard 31 files per disc side or DOUBLE THE NUMBER to 62 files. The size is selected at formatting time. Copying between discs with different catalogue sizes works perfectly normally.
- A FORMATTING PROGRAM is built in, permitting formatting to 35, 40, 80 track formats with either 31 or 62 files. Since the formatter is built into the DFS it can be used without affecting whatever program you are using.
- A DISC VERIFIER is also built in. This checks the internal checksums on each sector to identify any corrupted data. This is extremely useful when saving valuable data as it shows faulty discs quickly and easily. Again it does not affect the program you are using.
- A built in DISC SECTOR EDITOR gives a screen window onto the disc enabling detailed editing of any byte on the disc. This is extremely useful for recovering accidently deleted files and can save weeks of work.
- A double step mode allows the user of 80 TRACK DRIVES TO READ AND WRITE BOTH 40 & 80 TRACK DISCS. This mode is software selected for each drive individually, thus allowing a 40 track disc to be copied onto an 80 track one very easily. THIS ELIMINATES THE NEED FOR EXPENSIVE SWITCHABLE DRIVES.
- A WORKFILE function sets the name to be used when the null filename is issued. This allows a program to be edited and repeatedly saved having only typed its name once. Automatic increment function SAVES successively numbered versions of a file, every time SAVE is used.
- When using LOAD, CHAIN etc., it is possible to specify an ambiguous filename. This will result in the first file whose name matches the specification being used. This saves typing the end of a filename that you know is uniquely identified by its first few characters.
- Two commands exist to simplify the transfer of programs from TAPE TO DISC. These load the file to &1100, switch off the disc system and then move the file to its correct load address, thus saving a lot of complicated programming. This command can be used to load files upto 27.75K long.
- An advanced COPY command is included which will prompt the user, requesting whether to copy each file.
- RENAME has been extended to allow the use of ambiguous filenames. This allows you to change BERT1, BERT2, BERT3 to FRED1, FRED2, FRED3 with only one command, much as you would on a mainframe!
- OPENOUT has been improved to give you fewer annoying 'Can't extend' errors, as it automatically picks the biggest space on the disc in which to put a file. A SPACE command lets you know how much space *COMPACT will create before you waste time compacting and possibly losing your program.
- 2K of RAM can be reclaimed from the DFS by setting "PAGE" to &1100.
- The DFS is fully compatible with TELETEXT, TORCH and both ACORN Second Processor systems. Discs prepared with the Watford DFS can be used under ACORN DFS without any changes, so there are no problems in exchanging software with ACORN DFS users.
- A comprehensive and clearly written manual is available seperately and this explains both the standard ACORN functions and the extra WATFORD features.

LOCKABLE DISK STORAGE UNITS



Strong plastic cases that afford real protection to your discs. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.

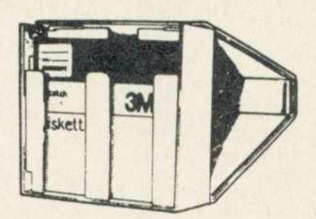
M35 holds upto 40 discs **£13**

M85 holds upto 95 discs **£17**

FLOPPY HEAD CLEANER KIT

The heads in a floppy disc drive are precision made and very sensitive to dirt. Drive manufacturers recommend that you clean the heads approximately once a week. Unless your home or office is dust free one of these kits is a very sensible precaution against losing valuable data. A dirty head can destroy many disks before you realise the trouble. Very simple to use.
Only **£9**

PLASTIC LIBRARY CASES



for Disc Storage 5¼" (holds 10) **£1.80**

Continued ▶

BBC MICRO WORD-PROCESSING PACKAGE

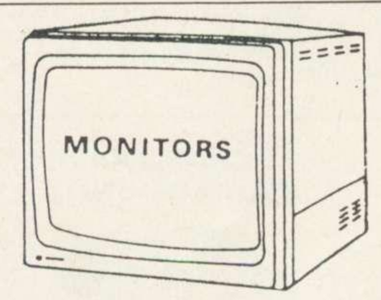
A complete word-processing package (which can be heavily modified to your requirements, maintaining the large discount). We supply everything you need to get a BBC micro running as a word-processor. Please call in for a demonstration.

EXAMPLE PACKAGE

BBC Model B, Watford Electronics' DFS upgrade, WORDWISE ROM, Twin 200k Teac drives in beige, Zenith 12" Hi-resolution monitor (Green or Amber), Brother HR15 daisywheel printer. Gemini software: BEEBCALC spreadsheet, analysis and DATABASE software on disc. 10 × 3M disc, 500 sheets fan-fold paper, 4 way mains trailing socket, manuals, all leads and BBC carrying case.

NEW LOW PRICE

Only £1,089



We stock a range of monitors to suit all needs. Choice of a monitor is a matter of personal taste so we recommend that whenever possible, you ask for a demonstration at our shop.

MICROVITEC

- 1431 – Medium resolution as used on the BBC television computer programme **£165**
- 1451 – High resolution, suitable for word processing in mode 0 .... **£237**
- 1441 – High res. exceeds the capabilities of the BBC micro **£385**
- 1431AP RGB + PAL and AUDIO **£199**
- 1451AP RGB + PAL and AUDIO **£305**
- Dust Cover for Microvitecs **£5.50**

All Microvitec Monitors are 14" RGB in their distinctive right angle sturdy metal case or the new beige plastic case. They are supplied complete with connecting lead to the BBC and a 3pin mains plug.

KAGA

- KAGA Vision 2 High Res. Colour **£225**
- KAGA Vision 3 Super High resolution, Colour **£310**

Kaga Monitors are 12" RGB colour units housed in an attractive beige plastic cabinet. They all have as standard, a genuine etched anti-glare screen.

ZENITH

12" Ultra high resolution monochrome monitor. Ideal for word processing as its green or amber screen is very restful to read. The high resolution makes it good for games too – you can really see the detail that has been put into the graphics .... ONLY **£68**

LEADS

BNC Lead for Zenith or Philips **£3**
RGB lead for KAGA **£5**

N.B. Carriage on Monitors **£7** (securicor)

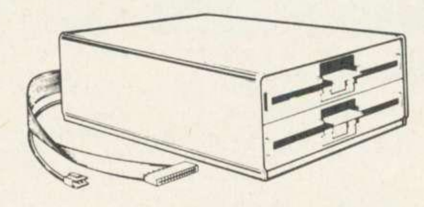
SWIVEL BASE FOR MONITORS



Only £15

DISC DRIVES PRICES SLASHED

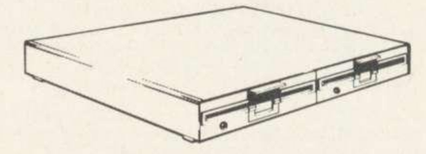
(NEW SLIM-LINE DRIVES)



(DRIVES Cased with Cables. No PSU. Connects directly to the BBC's power socket.)

- **CLS 100** Single, TEC Single sided 40 track 100K, $5\frac{1}{4}$" Disc Drive **£89**
- **CLS200** Single EPSON Drive, Double sided 40 track, 200K, $5\frac{1}{4}$" **£99**
- **CLS400** Single, Mitsubishi/Epson Double sided 80 track 400K, $5\frac{1}{4}$" Disc Drive **£126**
- **CLS400S** Single, Mitsubishi/Epson Double sided 40/80 track Switchable, 400K, $5\frac{1}{4}$" Disc Drive **£145**
- **CLD200** TEC Single sided 40 track 200K twin $5\frac{1}{4}$" Drives **£165**
- **CLD400** Epson, Double sided 40 track 400K, $5\frac{1}{4}$" TWIN Drives **£199**
- **CLD800** Mitsubishi/Epson Double sided 80 track 800K, $5\frac{1}{4}$" TWIN Drives **£235**
- **CLD800S** Mitsubishi/Epson Double sided 40/80 track switchable, 800K, Drives **£299**

(CUMANA) DRIVES CASED WITH PSU & CABLES



- **CS100** TEC Single sided 40 track 100K $5\frac{1}{4}$" Single Disc Drive **£119**
- **CS200** Epson Double sided 40 track 200K $5\frac{1}{4}$" Single Disc Drive **£149**
- **CS400** Mitsubishi/Epson Double sided 80 track 400K $5\frac{1}{4}$" Single Drive **£165**
- **CS400S** Mitsubishi/Epson Double sided 80 track 400K $5\frac{1}{4}$" Single Drive **£179**
- **CD200** TEC Single sided 40 track 200K $5\frac{1}{4}$" TWIN Disc Drives **£236**
- **CD400** EPSON Double sided 40 track 400K $5\frac{1}{4}$" TWIN Disc Drives **£280**
- **CD800** Mitsubishi Double sided 80 track 800K $5\frac{1}{4}$" TWIN Drives **£339**
- **CD800S** Mitsubishi Double sided 40/80 track Switchable 800K TWIN Drives **£350**
- SPARE DRIVE CABLES, SINGLE **£6;** DUAL **£8**
- DFS Manual (comprehensive) **£7** (No VAT)

(Carriage on Disc Drives £7 securicor)

P.S.

- You do not require a formatting Disc nor the expensive 40/80 track switchable Drives when using Watford's sophisticated Disc Filing System which has this facility as one of the many facilities incorporated in it as standard.

Cont.

- MITSUBISHI & EPSON Slimline 400K Disc Drives that we supply are Double sided Double Density, 1 Megabyte unformatted, (With BBC Micro 400K after formatting). When used in conjunction with our Double Density Interface, you obtain 725K formatted. Track density is 96 TPI, track to track access time is 3mSec. These drives are very fast, quiet and efficient. We strongly recommend them.
- Extensive test carried out in our workshop has proved that the BBC Micro's own switchmode power supply is capable of driving 2 disc drives and a host of Sideways ROMs without undue heating. We recommend our CLS & CLD range of Disc Drives which will save you considerable expense without sacrificing performance.
- Please send an SAE, for further technical specification on our Disc Drives.

DUST COVERS

(For our Disc Drives)

Single (without PSU) **£3.20**
Twin (without PSU) **£3.85**
Single (with PSU) **£3.25**
Twin (with PSU) **£3.90**
Twin (side by side with PSU) **£3.95**

DISC ALBUMS

Attractively finished in beige leather-look vinyl, these conveniently store up to 20 discs. Each disc can easily be seen through the clear view pockets.

£4.25

FORTH ROM for BBC

This ROM provides a complete implementation of the FIG-FORTH standard (including editor). Supplied with a large tutorial manual at only **£32**

TINY PASCAL for BBC Micro £54

All prices exclusive of VAT

MYSTERIES OF DISC DRIVES & DFS REVEALED

Are you tired of faulty cassettes, and lengthy loading times? Do you want to upgrade your BBC micro to take discs but you get tied up in the plethora of jargon surrounding the choice and use of these systems.

For instance, what is the difference between single and double density formats, how can you use a 40 track disc on an 80 track disc drive? What is the difference between a DFS and disc interface kit? Should you acquire a single Disc drive or twin? What does 48 TPI and 96 TPI discs mean? These are just a few of the questions you may have asked yourself and never found the answer or maybe you have yet to encounter these questions.

Now the mystery of buying a suitable interface and disc drive for your BBC micro is revealed in Watford Electronic's new book entitled 'MYSTERIES of DISC DRIVES & DFS REVEALED'. It describes in fine detail, yet remaining very readable to the beginner, how disc drives operate, the type of interfaces available, which type of discs to use on a disc drive and how data is stored on the discs.

There is even a handy section describing the phrases you are likely to encounter, and how to interpret them. This book must be an essential purchase at £5.95, especially if you own or are thinking of buying a disc system.

£5.95 (Book No VAT)

THE EPSON FX/KAGA PRINTER COMMANDS REVEALED

for the BBC Microcomputer
(The only Printer Book for the Epson FX-80 compatible printers).

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

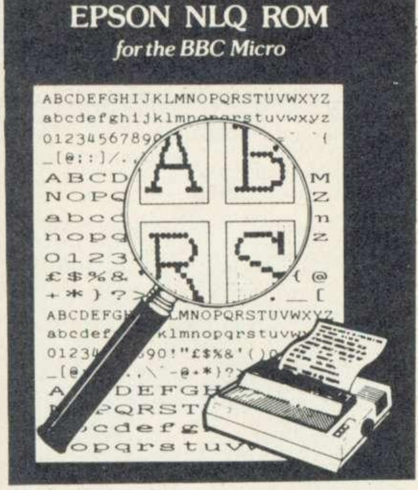
Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX/KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English how to use your printer (Kaga KP810, Canon PW1080A, or any other Epson FX-80 compatible printer) with the BBC micro, both from Basic and your Wordwise wordprocessor.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

This book is superb value at only
£5.95 (Book – No VAT)

EPSON FX/RX NEAR LETTER QUALITY PRINT ROM



Impress your friends and business colleagues with the quality of your letters and printed material with Watford's very simple to use EPSON NLQ! (Near Letter Quality) ROM. Suitable for FX80, RX80, RX80F/T, FX100.

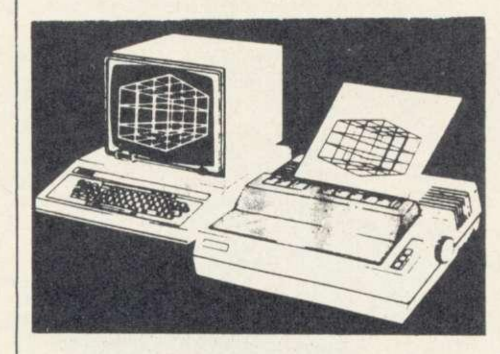
Look at the features:

- Simply type *NLQ80/100 and a single VDU code to use NLQ print.
- NLQ is then available without any modifications from BASIC, WORDWISE, VIEW (with NLQ DRIVER) or virtually any other program or language.
- Single codes select PROPORTIONAL type (yes even on the RX80); ENLARGED type; UNDERLINED type. These features can be used seperately or in any combination.
- Full UK character set.

Standard 'pica size'
Proportional spacing
Enlarged
Underlined
Normal type
The NLQ ROM is incredibly easy to fit and use.
Supplied complete with Manual.

Only: £20

DUMPOUT 3
NOW WITH EXTRA FEATURES!



A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including all Mode 7 facilities etc. We have to admit that there is one facility that we cannot replicate – if anyone can supply flashing ink we would like to know!

The ROM also provides window setting utilities and two new OSWORD calls that allow mode 7 graphics pixels to be read and plotted using the standard graphic co-ordinate system. The latest version includes a graphic dump trigger for dumping screens from games whilst they are running.

Two commands are used to operate the dump routines:

*GIMAGE – This provides a full graphics dump of any Mode (including Mode 8). There are many optional parameters but you need only specify the parameters you wish to change.

- V <scale>, H <scale> – These 2 byte numbers give fine control over the size of the dump from minute to enormous. Unlike other dump ROMs, scale works the same in all modes inc. mode 7.
- R <0-3> – Print dump rotated by 0, 90, 180, 270 degrees.
- I <indent> – Set gap from left edge of paper.
- X <min><max>, Y <min><max> – Selects screen area, by default the whole graphics window is dumped.
- P – Dump shows physical colour values.
- G – Grey scale reproduction, dumps otherwise use a negative scale (white prints darkest).
- T Two tone dump for maximum resolution.
- M <mask> – 8 bit colour mask.
- E – Contrast expansion to make mode 7 text and separated graphics stand out clearly from the background.
- C – All mode 7 graphics are printed as contiguous to improve the shading in graphic areas.
- K – Key-triggered dump. The dump does not commence immediately, but can be triggered off later by pressing <SHIFT><0> or <CTRL><ESCAPE>.
- S – Switch-triggered dump. As K, but the trigger is an external switch (not supplied) connected to the user port. The S option can still work with games that corrupt RAM page D.

*TIMAGE <indent> – Does a fast, text only, dump of the contents of the text window in any mode.

*GWINDOW and *TWINDOW – These commands draw the graphics and text windows, respectively, on the screen and allow them to be changed with the cursor keys. Note that GIMAGE and GWINDOW work fully in mode 7. Designed for use with the following printers: CP80, GP80/100/250, CANNON, STAR, KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, LPVII, NEC PC8023, DMP100/120/200/400, etc. etc.

Price including comprehensive manual **£22**

VIEW

VIEW WORDPROCESSOR
We are supplying the new VIEW version 2.1 allowing printing of memory contents etc **£46**

HI-VIEW

A special version of VIEW designed for use with 6502 2nd Processor. Available on disc, it offers 47K of text memory.
.... **£49**

VIEWSHEET (Acornsoft) **£49**

Watford's own Sophisticated VIEW Printer Driver for FX80

To simplify using the full facilities of the Epson FX80 or Kaga KP810 use this printer driver. Full facilities are provided for selecting between fonts etc. The disc includes examples of use and instructions. Available on 40 or 80 track disc (please state which required). **£6**

VIEW DRIVERS FOR JUKI & BROTHER PRINTERS

Only £7

VIEW/VIEW SHEET PRINTER DRIVER for SILVER REED
(Officially approved by Silver Reed)

A range of VIEW Printer drivers to complement the Silver Reed range of printers EXP400/500/550 & 770 and converted typewriters EX43/44 & 55.

Only: £7

BEEB PRINTER ROM



This utility ROM is designed to simplify using all the facilities of your printer. It has many facilities:

★ Selection of printer modes such as underline, font and size is by 'Single Key' operations.

★ From Wordwise, a single number following OC will select a mode rather than a long and incomprehensible string of control codes. This makes using your printer with Wordwise much more convenient.

★ When using Basic (or other languages) you can have control over the formatting of the output to the printer in the style of a wordprocessor. You can define page top, bottom and side margins etc. with intelligent page skip for binders an option. All supported printers will now respond to form-feed etc. commands.

★ User defined characters are printed as you see them on the screen so that non-standard characters are automatically printed out correctly.

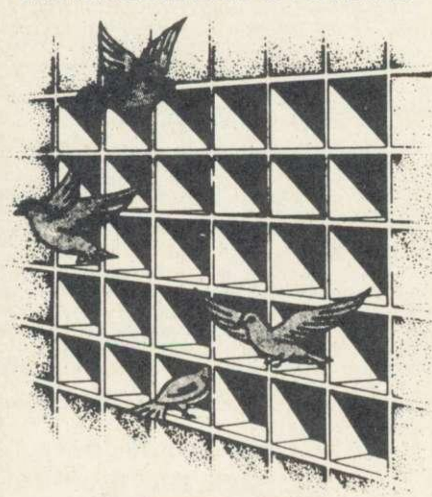
★ Commands select the options for the following printers:
GP100, STAR, NEC, MX/FX, KAGA, LP/VII/DMP100, DMP200.
Operates with either parallel or serial interfaces.

★ Supplied with a 50 page manual that is very comprehensive and easy to follow. Please specify printer type when ordering so that we can send the correct function key strip.

Price: £24

Continued ▶

TWO DATABASE MANAGEMENT SYSTEMS



DISCDATA

Discdata is an entirely disc based database handling system. It is extremely easy to use through its comprehensive menu system. The simplicity is such that we do not feel the need to provide explanation on use in the written guidance supplied with the program. The first-time database user will rapidly become familiar with this package designed throughout to be simple and obvious.
Despite the ease of use this system provides all the facilities needed for complex data handling problems. The length of database that can be handled is only limited by the total space on the disc. You can have up to 20 fields with page length records up to 254 bytes in length. Adding and deleting records, amend titles, field names and records. Sort on any field and search for any record or group of records in any field. The database may be re-formatted after creation, the system will re-write all your files for you automatically. You may add extra fields and extend the length of existing fields freely.
Output formatting is very powerful. You are allowed 40, 80 or 132 column output modes going to printer or screen. Selected fields can be put in any order on the screen or printer, either across the paper or down. Output can start or stop anywhere in the file. Decimal fields are automatically totalled and records output are counted. Version 2, now on sale has improved input and amendments procedures giving full record edit as well as the 3 extra features . . . String searching, Calculations on numeric fields, and the ability to create sub files from your main files.

On disc at **Only £17**

(Please specify 40 or 80 track when ordering)

FILE-PLUS

The File-Plus package is even more powerful and flexible than Disc-Data. It is also largely menu driven but has its own command language for file searching. The 16K ROM contains all the normally required routines, with lesser used options supplied on the utilities disc. All input and output formatting is controlled through screen forms. A full screen editing system is used to define a form which allows tremendous flexibility in the format in which your data is displayed. It is very easy to change from form to form so that you can type in your data with one form, and examine it with others. You will typically design several forms before starting to access the database so that you can quickly and easily see the fields of each record that you want to appear in the layout you decide on. The form system is also used for output to your printer. File Plus has a unique file linking system that allows the entire on-line storage of your system to be used for one database. This can give around 1.5 Megabyte databases using dual drives and double density.
The built in FQL (File-Plus Query Language) can be used for searching the database. Presented in the form of a powerful command language with looping facilities etc. this allows the most flexible access to your data possible. Full arithmetic operations are provided to allow the system to be used for statistical analysis.

Cont.

Operations supported are –, +, *, /, +–999999 9999.9999 and compare facilities =, >,<>>=, >=, <, &,.
Many keywords are supported by the language: assign, compare, display, and, goto, iff, ift, print, read, search, spool and update.
Supplied with a very detailed 70 page manual to explain all the facilities with many examples.

Only £43

(Please specify 40 or 80 tracks for the utilities disc)

DATAGEM

Gemini's 24K ROM based DATABASE Management System

Special Offer: **£110**

PEN PAL – VERSATILE LIGHT PEN SOFTWARE

Do you have a light pen that never gets used? Then this piece of software is for you. This package offers many useful facilities that make the light pen a useful device to own. Facilities included are:

- Pixel, Line and Character definition
- Free hand drawing
- All Colours
- Fill, Refill and stripes
- User defined "Brush strokes" plus character definer
- Grid, Scale and perspective aids 2 to 200 points palletable in one design with Circles and "rubber banding"
- Move design/character to any screen position
- Save and Load screens, User defined characters and line drawings for video titles, own programmes etc.

This program has many uses in education and at home. It is supplied with a comprehensive instruction manual.
Works with Watford, RH, Acorn User, DIY and many other Light Pens.
Prices
TAPE .... **£11**; DISC **£12**

LIGHT PEN



This Light Pen for the BBC micro is packaged in a neat pen shape with built in switch. Supplied complete with our sophisticated Pen-Pal software on cassette (see eleswhere in this ad).

Only **£20**

(For software on disc please add £2)

DISC EXECUTOR

Disc Executor is a sophisticated disc utility for the transfer of your cassette programs to disc. If you have difficulties transferring your cassette software to your disc system then this is the answer. It handles 'locked' files and full length adventures (up to &&e blocks) and programs that load below &E00. It is very simple to operate with instructions supplied. It saves you time and money.

Price **£10**

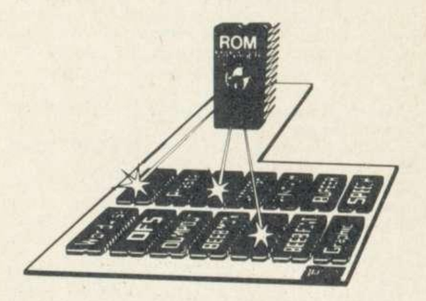
(Please specify 40 or 80 track discs)

ADE

'Systems' complete program development package in a 16K ROM. Full assembling and debugging facilities provided.

SPECIAL OFFER ONLY **£43**

ROM MANAGER

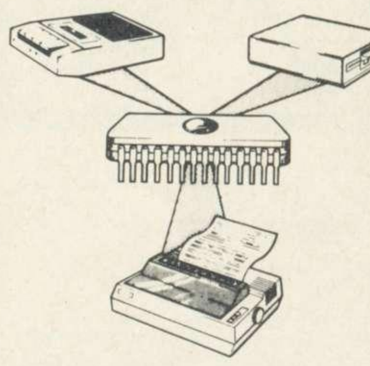


'Provides comprehensive management of all your installed ROMs – BEEBUG Nov. '84'.
This ROM is unique in its capabilities. It allows you, the user, full control over the BBC Micro's sideways ROM paging system with simple to use commands. This ROM is essential for those with several ROMs. At a simple level ROM MANAGER can be used to remove the problem of clashing command names and allow full use of all the facilities of your ROMs. This is coupled with facilities to completely enable or disable various ROMs in the machine including ROM manager itself.
ROM MANAGER can also be used to develop sideways ROMs using the machine's standard memory. This is achieved by sending sideways ROM calls to your code in RAM, saving the expense of fitting sideways RAM for ROM development purposes. ROM status reports are also given by the ROM, including ROM lengths, checksums, entry points supported and current filing system title.
The ROM also provides facilities to examine ROMs, list function keys for editing, modify RAM (using a HEX/ASCII editor) and list ROM titles neatly and concisely.

All selection between particular ROMs is by the name of the ROM and this may be abbreviated for convenience. ROM numbers can also be used if required. This ROM is very simple and obvious to use. All the facilities are explained in the clear and detailed manual.

Price **£22**

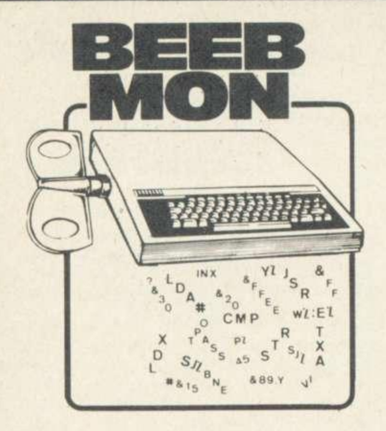
BUFFER & BACKUP ROM



For those with sideways RAM fitted in their machines this utility ROM will make full use of this facility. By using the sideways RAM area for extra memory the following features are implemented:

★ 4K or 16K buffer for parallel printer.
★ Dumps selection of Disc files to Tape.
★ Makes backup copies of tapes on to tape and disc.
★ Displays contents of paged ROMs on screen.
★ Menu display of ROM filing system contents on Shift-Break.
★ Comprehensive manual.

Only £22



Watford's own Machine code Monitor ROM written by Andrew Bray (Cambridge), co-author of the BBC Micro Advance User Guide.

The most powerful and versatile machine code monitor ROM yet written for BBC Micro. It has all the normal memory editing, moving and relocating facilities, plus all editing is with a full screen editor allowing scrolling up and down memory, entering in Hex, ASCII or standard assembler mnemonics.
In use as a debugging tool, you run code under a total emulation system. Ever felt a desperate urge to set a break point in ROM? No problem – you can even have breakpoint on reading or writing locations in memory and on register contents. The system fully supports debugging of sideways ROMs e.g. BASIC can fully and easily be run from within Beebmon and from there DFS and other sideways ROMs can be used in total emulation mode.
Beebmon can even run itself. In so doing you can nest Beebmon up to a level limited only by the memory size. Beebmon uses 256 bytes of workspace, located anywhere in memory, even on the 1MHz Bus. Beebmon effectively uses no zero page workspace, so your program (e.g. BASIC) can use any or all of the base page. How does it achieve this? By providing a 6502 interpreter all programs running under it exist in a vertual BBC, so special memory locations like the ROM latch are not actually accessed by your programs, instead they alter a location in Beebmon's workspace. Emulation also allows immediate return to Beebmon command level by ctrl-escape no matter what code is being executed at the time. All this exceptional power and flexibility is complemented by a clear and detailed manual included in a value for money price of:

£22

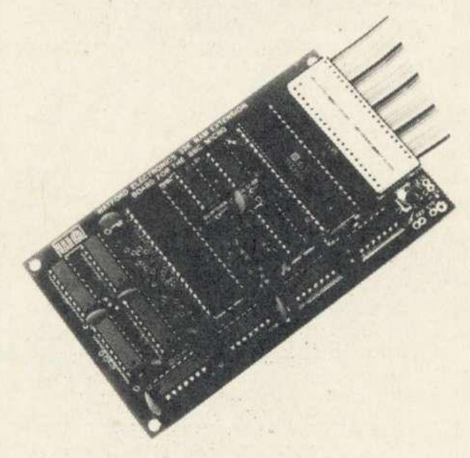


Discover the hidden secrets of BASIC and the OPERATING SYSTEM with this easy to use progammers tool.
A ROM based machine code Disassembler for the BBC micro. It enables machine code programs to be listed in BASIC/DUMP format and thus is the perfect complement to the built in assembler. It allows Sideways ROMs, files on disk or tape to be listed, and also has a comprehensive editor, allowing mnemonics to be altered directly, as well as HEX, DECIMAL ASCII and BINARY memory editing. There is also a full set of labelling facilities available (up to 3,200 labels), with the major locations and routines already labelled.
Thus DIS-ASM enables any monitor program, such as BEEBMON to be used to much greater effect as it is not necessary to disassemble memory each time the display is altered.

ONLY **£18**

32K RAM

EXPANSION BOARD



Now Watford Electronics brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. It simply plugs into your micro's 6502 processor socket. (No soldering required). This compact board which fits inside the computer doesn't just give you 16k or even 30k of extra RAM, but a massive **32K !!!**
There are many more useful facilities available with this board:

- The top 20K of the expansion RAM can be used as the screen display memory, leaving all the standard BBC RAM free for programs or data storage. This allows good graphics and long programs to be combined. For instance you could have MODE 0/1/2 GRAPHICS AND 28K OF PROGRAM SPACE. The extra memory can be used by virtually any language or utility such as BASIC, VIEW, WORDWISE, etc.

- The FULL 32K or the bottom 12K of the expansion RAM can be used as a PRINTER BUFFER for SERIAL or PARALLEL printers, sound channels, RS423, Keyboard or Speech Synthesiser. This allows very long text files to be printed while you are using 28K of program and 20K of graphics! THE BUFFER IS UNIQUE because it replaces one of the BBC Micro's buffers so all the buffer options are available on it. e.g. *FX15,21,138, 145, ADVAL (–no.) etc.

- This board is the ideal complement to any word processing system, disc or cassette based. There is no need to wait for slow printers as you can type in long text in 80 column display mode while printing is going on – TWO JOBS DONE SIMULTANEOUSLY!!! (an equivalent printer buffer would cost you £120 +)

- Unlike our competitors, the board is compatible with a vast range of software and hardware available for the BBC microcomputer, including our ROM expansion board, double density DFS Units and the ATPL ROM extension board. This is because our board is connected to the computer by means of a ribbon cable without soldering. It can be either be left in the micro or stuck to the lid with the 4 self adhesive feet supplied.

- The board comes with a comprehensive manual and ROM based software with a large range of commands for machine code and BASIC users, including many *HELP messages.

Only: £65

GRAPH PAD

With this popular British Micro's Graph-pad, you can add new dimensions to your computer enjoyment. It helps you to create your own application programs by the simple use of the Graphpad. Ideal for Educational use. Supplied complete with Cables, Manual and a two program cassette.

SPECIAL OFFER **£86**

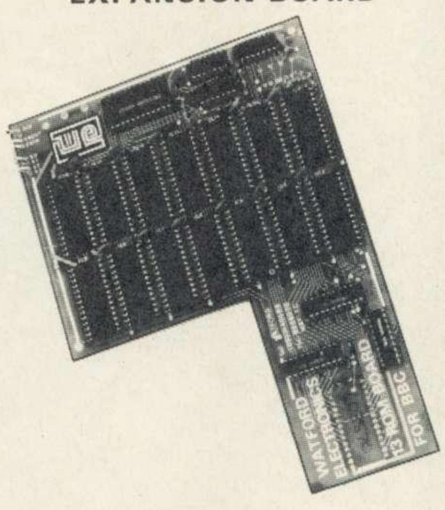
BEEBFONT ROM

BEEBFONT is a remarkable and different concept in BBC software supplied on a 16K ROM. It allows you to display text on the screen in 13 different styles:

It works in modes 0, 1, 2 and 4 using the full colour capabilities of each mode. Characters are printed in the same way as normal. Selection between the various fonts is very easily achieved with Ctrl-V – press this followed by a font number and the output will continue in the new font. Beebfont ROM is particularly useful in display work with the characters produced at twice the normal size.
You can create your own character fonts with the editor supplied. You can also print-out pre-formatted text files using the special characters with Epson FX, RX and NEC printers. The full range of character styles can be used, controlled from within the text. The editor and spooler program are supplied with the package, on cassette or disc. The spooler allows word processor (Wordwise & View) output to be printed in the new characters.
A twenty page manual is supplied. Please state printer type and media for the editor & spooler when ordering (cassette, 40 or 80 track disc).

SPECIAL PRICE
ONLY **£32**

Mk-2 13 ROM SOCKET EXPANSION BOARD



Now all lines fully buffered – On board battery back-up facility – will now accept EPROMS 2716, 2732, 2764 & 27128 and ROMs 6116 & 6264.
Simply plugs into one of the four ROM sockets currently available in BBC Micro. There are only 5 solder connections to be made. Full instructions are supplied. Unlike other ROM Boards, this board has been ergonomically designed to enable the user, easy further expansion inside the Micro, e.g. Double Density Board, Torch Board, RAM Card, etc., without any clash. (At Watford, we think ahead).
Our Mk2 13 ROM Socket Board enables the User to increase the sideways ROM capacity from the basic 4 sockets upto full 16 capable of being supported by current operating systems. In addition the board is designed with the facility to hold upto 16K RAM, which when switched into operation is automatically selected by any WRITE signal to the Sideways ROM area. This gives the User the ability to write a utility or language and upon pressing break have the utility or language up and running (new ROM software can be developed and tested in situ.)

The Board gives the User, plenty of freedom to explore the possibilities of the new paged ROMs due in the coming months and offers them the chance to develop their own.

All lines are fully buffered and the board meets or exceeds all timings for operation in the BBC Microcomputer. When fully populated, the ROM Board consumes less than half the recommended maximum current limit.

Supplied ready-built and tested complete with fitting instructions.

SPECIAL OFFER: £28 (carr. £1)

Continued ▶

BOOKS (No VAT on Books)

30 Hour BASIC (BBC Micro)	£6.95
35 Education Programs for BBC	£6.95
36 Challenging Games for BBC	£5.95
40 Educational Programs for BBC	£5.95
100 Programs for BBC Micro	£6.95
Cassette version of above	£10.00
6502 Application Book	£11.95
6502 Assembly Language Program	£13.95
6502 Assembly Language Subroutines	£14.25
6502 Machine Code for Beginners	£5.95
6502 Machine code for Humans	£7.95
6502 Software Design	£10.50
A young persons guide to BBC Basic	£4.50
A beginners guide to LISP	£10.95
Advanced Machine Code Technique for BBC	£7.95
Advanced User Guide for BBC Micro	£11.95
Advanced Graphics with BBC	£9.95
Advanced 6502 Programming	£12.45
Assembly Language Programming on BBC Micro	£7.95
Advanced Programming Techniques for the BBC Micro	£7.95
BBC Basic	£7.95
BBC BASIC	£5.95
BBC Computer Magic	£5.50
BBC DIY Robotics & Sensors	£6.95
BBC Forth	£7.50
BBC Lisp	£7.50
BBC Micro An Expert Guide	£6.95
BBC Micro Book BASIC Sound & Graphics	£7.95
BBC Micro Graphics and Sound	£6.95
BBC Micro Programs in Basic	£5.95
BBC Micro **ROM PAGING** System Explained	£2.00
BBC Micro Revealed	£6.95
BBC Micro Assembly Lang. Prog.	£7.95
BBC Micro Disc Companion	£7.95
BBC Micro in Education	£6.50
Basic Programming on BBC Micro	£5.95
CP/M The software BUS	£8.95
CP/M Users Guide	£13.95
Creating Adventure Programs on BBC Micros	£6.95
Creative Graphics Cassette (Acornsoft). Has 36 graphics programs	£8.95
Creative graphics on BBC Micro	£7.50
Complete Programmer for BBC	£5.95
DISC FILING SYSTEM (DFS) Operating Manual for BBC	£6.95
Discover BBC Machine Code	£6.95
Discover FORTH	£13.95
DIY Robotics & Sensors with BBC	£6.95
Exploring FORTH	£6.95
Further Prog. for BBC Micro	£5.95
Forth Programming	£14.40
Functional Forth for the BBC Micro	£5.95
Games BBC Computer Can Play	£6.95
Getting more from your BBC & Electron	£6.95
Graphs & Charts on BBC Micro	£7.50
Graphic Art for BBC Computer	£5.95
Graphs and Charts (Cassette)	£7.50
Introducing the BBC Micro	£5.95
Introduction to FORTH	£9.30
Interfacing projects for the BBC Micro	£6.95
Introducing LOGO	£5.95
Let your BBC teach u to program	£6.45
LISP	£9.25
Logo Programming	£8.95
Mysteries of DISC DRIVES and DFS REVEALED	**£5.95**
Mastering CP/M	£13.65
Programming the 6502	£11.95
Programming the Z80	£14.25
PASCAL	£9.25
Structured Prog. with BBC BASIC	£6.50
The Complete FORTH	£6.95
The Epson FX/KAGA PRINTER Commands REVEALED	**£5.95**
Using Floppy Discs with BBC Micro	£5.95
Using BBC Basic	£6.95
Wordstar & CP/M made easy	£6.95

Watford brings you

THE AMX MOUSE

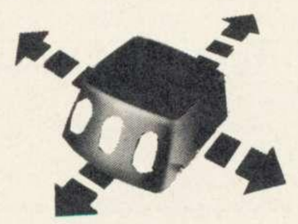
'The program is simplicity itself and the user manual is virtually redundant' . . . Micro User Jan. 85.

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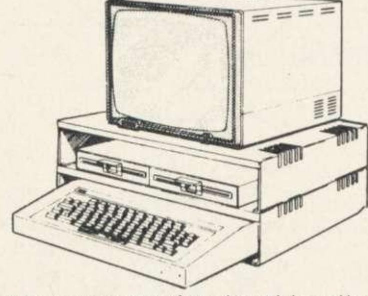
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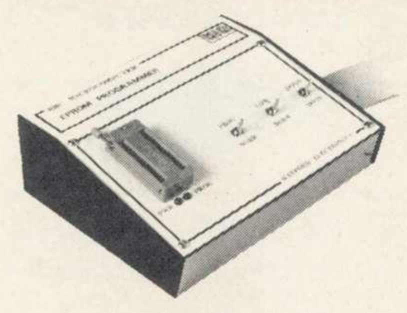
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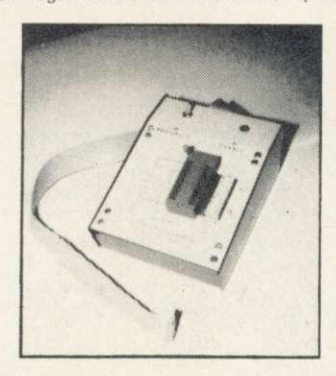
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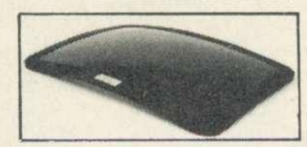
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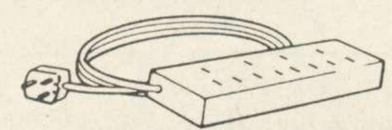
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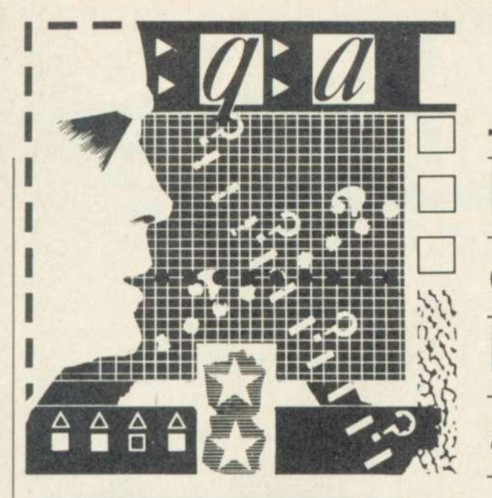
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Improving the search facilities on your database, compiling a procedure library and Kenneth Kendall's cold are among Martin Phillips' topics

Improving our database search facilities

LAST month I described how a simple database could be programmed and then extended. This month I'm going to improve the way it prints out the information by adding some simple search facilities.

The first simple change to be made enables you to have any title for the database. As the final version stood last month, the title 'Address Book' always came up when scrolling through the data. To replace this with your choice of name, first input your title at a suitable point in the program.

This has been done in the procedure PROCenterfields at line 1415 of listing 1 (as it's only one line, the program has not been renumbered). The title name is stored in the string variable title$, then lines 910 and 980 are changed to include this. A minor complication now is that we cannot say how long the title will be, so the program must determine this in order to centre it on the screen. This simple routine works well, but problems will occur if the title is longer than 40 characters – a test for this could be made when the title is entered.

Simple, you may say, and a nice touch, but how does the program remember the title when a new database is loaded in? The answer is it doesn't – this title needs to be saved and loaded in too. Lines 640 and 800 are convenient places in the save and load routines respectively. Just load and save the string variable title$ as well as F%.

Unfortunately this is where some trouble starts, because after changing the database to version 6 as detailed above, and attempting to load in a previous database, an error will result (Type mismatch at line 680), as we have changed the structure of the data file to be loaded in, but not that of the data stored on disc or cassette. 'Oh no,' I can hear you saying. 'Do I have to type in all the data yet again?' Fortunately there's a dodge we can use to alter the data stored on disc or cassette without having to re-write it all. It's rather crude but can save quite a lot of hard work, and can often be useful for debugging programs.

Once the 'Type mismatch' error has occurred, type:

```
CLOSE #0
```

to close any open files. This is necessary as the one being read will still be open because the program stopped before the file was able to be closed. To show this, run the program again, and a 'File open at line 630' error message will appear this time. Pressing Break will close all the files, but don't do this, as it will also clear all the stored data which we are going to resave.

After closing the file, enter the title of the file as a direct statement, eg:

```
title$="Address book"
```

Next type the direct statement:

```
GOTO 750
```

and press Return. This will start the program off again, but inside the procedure PROCsave. It will then allow the file to be saved, with its title. It's wise to give the new data file a different filename, although the same one can be used. When the program has saved the data, it will give an error message and stop at the end of the procedure (No PROC at line 860). This doesn't matter as the program can simply be re-run, and the new data file should load in without error.

I'll tell you how this technique works. When a program stops because an error has occurred (or if Escape is pressed) none of the variables are cleared. Then when the program is sent to the save procedure, it is able to find and save all the data required. The one variable it did not know, title$, was entered directly. The program will not continue to run correctly because we went into the middle of a procedure. By choosing a different entry point it's possible to keep the program running. GOTO 80 will do this but then it will be necessary to go through the menu to reach the save routine.

Often it's useful to be able to check the value of variables when a program fails to run correctly. When a program stops after an error, the values of any variables can be found by using PRINT followed by the variable. I find this especially useful when I get the dreaded 'No such variable' error. Printing out all the variables on the given line one-by-one soon produces the offender.

Next the program needs to be improved to include a search routine, and I've added a printer output facility. In listing 2, line 140 has been altered and the procedure PROClook re-written to present a menu of options. It also displays whether the printer option is on or off. A new procedure, PROCsearch, has been included to provide the printer facility and a search option. First the title and field names are displayed on the screen, then the user is invited to select the field under which the search is to be carried out. The string to be searched for is entered and the procedure will print out those records where a match is found. If no string is entered, but the Return key is pressed, all the records will be displayed.

The search routine is accomplished by using the useful INSTR statement. There is a well-documented bug in Basic 1 in the INSTR statement which will corrupt the program, and occurs if the string being searched is shorter than the search string. Line 1620 has been inserted to test for this. It's not necessary for Electron users, or if you have Basic 2 fitted, but it does no harm to leave it in.

Having got to this stage, the program

IF YOU have a technical hitch or a programming problem let Martin Phillips give his diagnosis. We'll pay £5 if you raise a really interesting point. Please give full details of the system you're using and include a listing where appropriate, making your question as specific as possible. WRITE TO: Hints & Tips, Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH.

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is still not perfect. There are many possible screen display improvements, and little error-trapping, especially for disc users, which could result in data being lost. The search routine could also be altered to search for more than one string at once.

I hope this has given you an insight into how you can build up a database (or other program) from simple ideas to a complete program. This has been made very much easier by the ability to use procedures, and most of the program development has been through the inclusion of new procedures to perform specific functions.

Econet NFS chip memory loss

WHERE programs are very long and will not fit into the normal memory space allocated by the BBC micro, it's possible to use extra memory set aside by the computer for purposes not required by the program. This can be a useful way of obtaining extra memory, but there are pitfalls for the unwary: one problem that I've come across twice in the last month is associated with the Econet network filing system (NFS) chip.

This problem was highlighted in Beeb Forum in March 1984 and affects programs which use page &D00. Even when the Econet NFS chip is disabled, it still maintains a vector in page &D00, and this will corrupt any program or data stored at that location. It appears this vector is accessed every time the Return key is pressed, so programs are easily corrupted. The cure is to include the following line at the start of a program which uses page &D00 to effectively disable this Econet vector:

```
?&224=&A6
```

Typing in the above line before the program is run will show whether the Econet is at fault.

This Econet NFS chip has been fitted, together with the Econet interface components, to all Beebs supplied to primary schools under the Dol half-price scheme. If you're not using the Econet, the best answer is to remove this chip and then the computer will behave as a normal BBC micro with disc interface.

To find the chip, switch off the machine and remove the top cover and the keyboard: the chip will be in it's socket, situated in the bottom right-hand corner of the main circuit board, and can be identified by its round green sticker. If you remove the chip, replace the case and switch on, the screen should simply show:

BBC Computer 32K
Acorn DFS

and the Econet station message will not appear. If you remove the wrong chip it can be replaced carefully and the correct one taken out. You should store it by pressing the pins into a piece of polystyrene covered in aluminium foil, or by sticking the pins back into the black foam supplied with new ROM software such as *Wordwise*, to prevent damage from static electricity. If the Econet is required at a later date, the chip can be replaced.

If in doubt about removing the NFS chip, take the computer to a dealer and let him remove it.

The Econet interface cannot be removed with the latest BBC micros as the Econet chip and the disc filing system (DFS) chip are supplied as one ROM, and removing the Econet will also remove the DFS.

Squeezing out the spaces

A PROBLEM that puzzles many beginners programming the BBC micro or Electron is why the computer prints out numbers with long gaps before them. Listing 3 illustrates the difficulty, where a times table is printed out across the screen with wide spacing. There is a way to change how numbers are spaced out on the screen, by altering the print format controlled by the integer variable @%. This fact is hidden in the depths of the BBC User Guide, but somewhat easier to find in that of the Electron.

In its simplest, and most useful form, @% can be set to give the total of spaces that will be reserved on the screen for a number. The number is printed at the right-hand end of the spaces. It's normally set to 10, so a two figure number will have eight leading spaces or blanks before it. The largest number required in the tables program will be 100 (10 times 10), so @% can be set to be three characters wide. This is called the field width. Add the following line 5 to listing 3:

```
5 @%=3
```

Now the program should be displayed in a more acceptable format. The field width can take a value between 0 and 255.

However, as with many aspects of BBC Basic, this @% variable has a more complex form. In hexadecimal the number is made up of four parameters:

@%=&(B4) (B3) (B2) (B1)

B1 is the character field width.
B2 is the number of digits printed in any of the formats available. It must have a value from 0 to 9 (or 0 to 10, see later). If the actual number is larger than specified by B2, then it will be rounded off.
B3 selects one of the following three types of format for printing out the number: B3=0 is called the general format and the one normally used. Integers will be printed as integers. Numbers in the range 0.1 to 1 will be printed as 0.1 etc, but those less than 0.1 will be printed in exponential format. B3=1 will put the print format into scientific notation where all numbers are printed as exponents, eg, 1000 will become 1E3 and 1200 will become 1.2E3. B3=2 is the fixed format where numbers will be printed with a set number of decimal places.
B4 determines whether a number converted by the STR$ function will be formatted by the above rules. If B4=1 then strings will be formatted paying attention to the setting of @%. Its normal

```
 1 x          9 =          9
 2 x          9 =         18
 3 x          9 =         27
 4 x          9 =         36
 5 x          9 =         45
 6 x          9 =         54
 7 x          9 =         63
 8 x          9 =         72
 9 x          9 =         81
10 x          9 =         90
```

Nine times table produced by listing 3 – note the wide spacing.

value is 0. If B1=10 (0A in hexadecimal), B2=3, B3=2 and B4=1, @% would take the value of @%=&0102030A.

If you find all this too much to grasp at once, use @% in its simplest form to control the character field width until you become familiar with the idea. Remember, however, that @% is one of the resident integer variables and will keep its value from one program to the next if you leave the computer on and no 'hard' Break is performed. This can give the most odd results if a new program is run and @% is not changed!

When Basic 2 was released, the number of digits printed out after the decimal point was increased from nine to 10, causing another complication. Also the default value for @% was changed from &A0A to &90A to give the same display as Basic 1. So to reset the print format, @% should be set to &90A. Setting @% to &A0A will give an extra decimal place with Basic 2.

13/20 for software

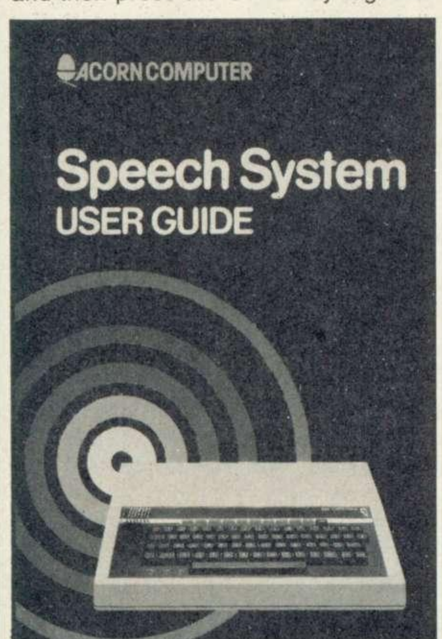
OUT of 20 educational software programs I've received in the last month, two discs were blank, four crashed while loading and the only cassette had a fault at block 7. Is this a record? Were the crashed discs the fault of my old non-standard equipment, you might ask? I rang up their publisher complaining that they would not run on three different new standard BBC systems, to be told that instead of using standard model B computers I needed a model B with Econet, 'because all the primary school computers have this fitted'. I'm learning all the time! Needless to say this software has been returned and a refund requested.

Does the Beeb transmit synthetic colds?

FOR those readers who have BBC computers with the Acorn speech synthesiser fitted, did you know that when Kenneth Kendall recorded the speech he had a cold? Type in the following line:

```
REPEAT:SOUND – 1,GET,0,0:
UNTIL 0
```

and then press the CTRL key together



with the F key (CTRL-F) to hear him cough. He does a pretty realistic sneeze if you press CTRL-B followed quickly by CTRL-J. I don't know, though, why Acorn decided to include the word Pierrot, which can be heard by pressing CTRL-D. When you get fed up with these try CTRL-C.

Setting up a procedure library

MANY readers have expressed interest in building up a procedure library (and Joe Telford has presented many over the years in his Jottings). Denise Downs and a colleague, Tim Scratcherd, have collected a library of structured, robust procedures for educational software to use at Huddersfield Polytechnic, and these are now being adapted for transmission on BBC telesoftware. I look forward to downloading them and thank Denise for the advance notice.

Procedures can be put in any order at the end of a program. Therefore, tried and tested procedures can be saved in personal libraries, called up and loaded in.

It's possible to load several into a program, and there are three ways this can be done. The first is to load in the procedure before writing the rest of the program, but only if just one pre-prepared procedure is to be included. If your program development progresses along random lines, you may not be aware that it will be required until the program is half-complete, so this method would be no use.

The next method is described in the BBC *User Guide*, and is also none too elegant. When the program you are developing is ready for the inclusion of the procedure type:

```
PRINT ~TOP-2
```

and call the resultant number XXXX. Then enter:

```
*LOAD "PROC" XXXX
```

to load in the procedure called PROC. Then type END and press Return to get the computer to sort out its internal pointers. Lastly, renumber the program.

The third method is the one I always use and recommend. It can be used with both tape or disc, and requires a little planning and preparation. It uses the *SPOOL and *EXEC commands. The procedure must first be typed into the computer and renumbered. I always start at 10000, as this method could overwrite existing program lines if low line numbers were used, and I have not yet written a program that long!

Once the procedure has been renumbered, save it by typing *SPOOL PROC, where PROC is your filename. Then type LIST and press Return. The procedure will now list and be saved to tape or disc line-by-line. Once it has finished, type *SPOOL and press Return to close the spool file.

When the procedure is required, simply type *EXEC PROC and press Return, and the spooled file will load in line-by-line. Ignore any error messages as these are normal. The procedure will have appended itself to the end of your program, which you must renumber. It is now possible to spool another procedure into the program. This method speeds up the writing of a program by using pre-prepared building blocks.

Quickfire questions

WHEN listing programs that don't have a space after the line number, first type LISTO 1 and press Return. This inserts a space after the line number when the program is listed, and can be cancelled with LISTO 0.

REMEMBER it's not necessary to list all of a program:

LIST 100	lists just line 100
LIST 100,200	lists lines 100 to 200 only
LIST ,100	lists up to line 100
LIST 100,	lists all lines after line 100

If working on a section of a program, you can program a function key to list part of it:

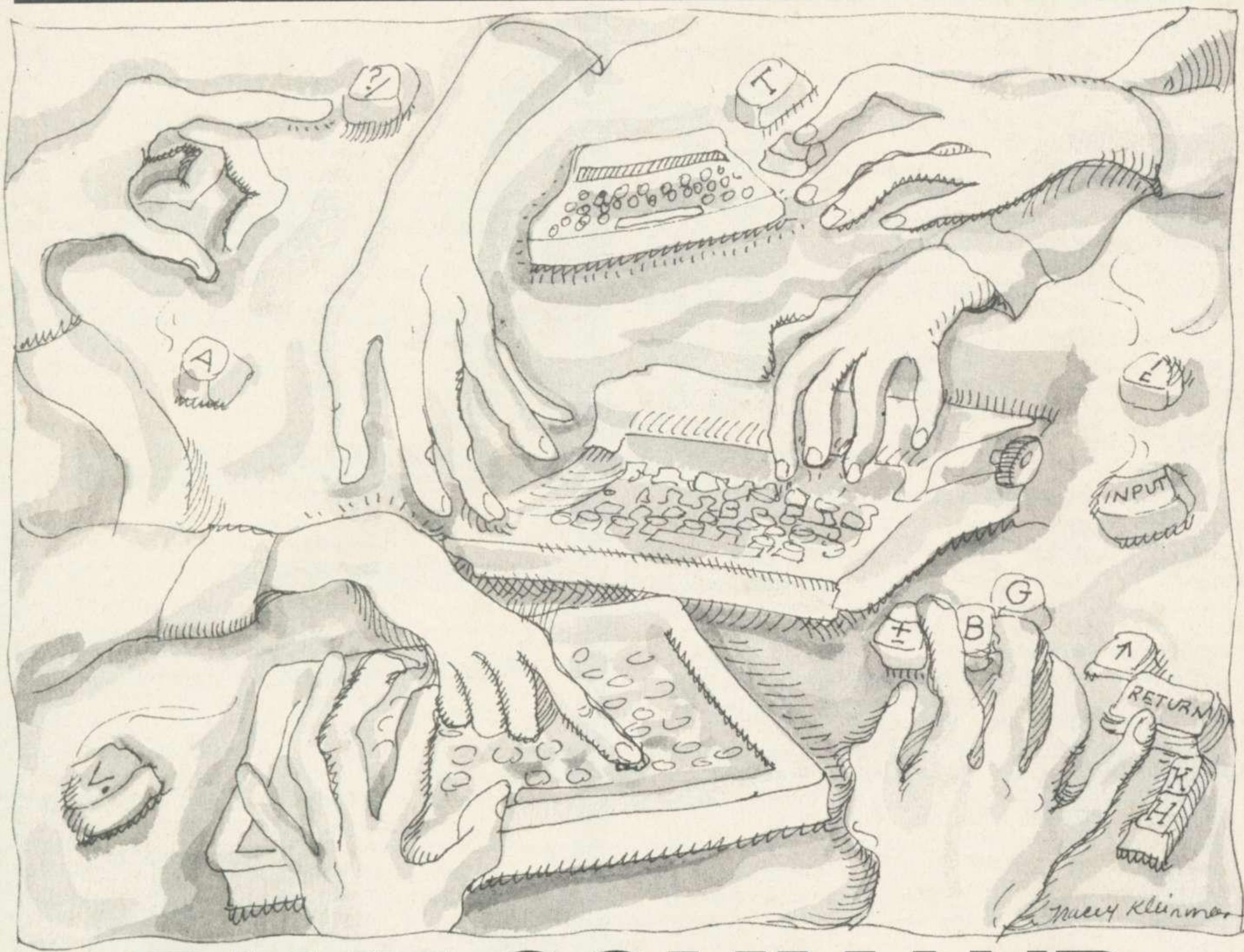
```
*KEY0 LIST 100,200 |M
```

When function key 0 is pressed it will list lines 100 to 200.

POS will return the horizontal position of the text cursor on the screen. This is useful, say, for detecting whether there is room to print another word on the same line or whether you need to start another. VPOS will return the vertical position of the text cursor.

TO move text a specific number of spaces across the screen, TAB followed by a single argument will print that many spaces.

You'll find Hints and Tips listings 1 to 3 are on yellow pages 97 to 99.



TAKE COMMAND OF YOUR KEYBOARD

Get to grips with the skill of inputting information into programs through the keyboard, with Tessie Revivis

PROGRAMS – as a computer owner they dominate your life! Sitting down to write one can present many problems and one of these is how to interact with your computer. Whether you want to write a game or a database, all programs need some information from the keyboard to work on. A game requires sequences of key presses to operate it, whereas a home database, such as the one presented by Martin Phillips in last and this month's Hints and Tips, needs continually updating, so getting information into the program is vital. So how do we go about doing this? Let's investigate!

The most common way is to use the INPUT command, which can read in numbers or strings of characters from the keyboard depending on the type of variable you specify after it. Try the following short program to demonstrate each:

```
10 CLS
20 INPUT "What is your name", A$
30 INPUT "What is your age", A%
40 PRINT "Hello ";A$;" are
you";A%
```

Notice how it's possible to include messages to the user within the INPUT command. Run the program and you'll notice that a question mark is printed after the message, indicating that your Electron or Beeb is expecting some information from you. Type in your name, then tell the micro you've finished by pressing the Return key. Next you'll be prompted for your age. When you've entered that press the Return key again, and your name and age will be printed out in the form of a sentence.

The information we have entered is now stored within the computer's memory. To prove it try typing PRINT A$,A%. Although the program uses variables beginning with A the suffix to each is different. The $ (pronounced

'dollar' or 'string') tells the micro that a series or string of characters is expected, and should be stored as such. The % (pronounced 'per cent') insists that you enter a number and anything else will cause an error.

Occasionally you may not want to have the question mark printed after the message, and this 'prompt' can be turned off by leaving out the comma immediately preceding the variable in lines 20 and 30 of the program. Try it and see.

Programs often require several items to be entered at the same time and this can be catered for using the INPUT command, as the following quickie shows:

```
10 CLS
20 INPUT "Enter three numbers",
A%,B%,C%
30 PRINT "Your numbers were",
A%,B%,C%
```

Line 20 does the donkey work by specifying three variables into which the numbers can be entered.

The really good thing about strings and variables is that they can be tested and, if you don't like the result, rejected! Suppose we were using the database program and wanted it to receive from the keyboard the name of the section it should move onto. The sections or headings might be called NAME, ADDRESS, and PHONE; the following loop will only proceed when you have correctly typed in the relevant section.

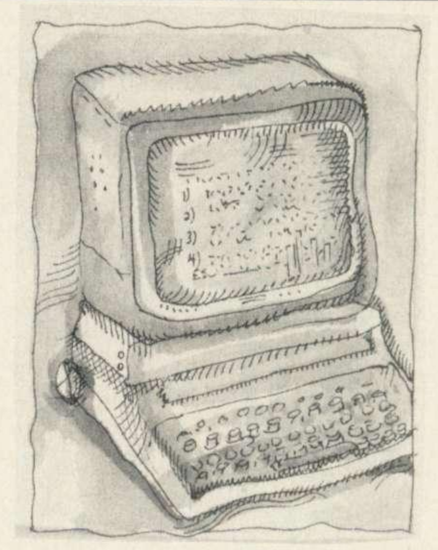
```
10 CLS
20 PRINT "What section do you
require"
30 PRINT "NAME, ADDRESS or
PHONE ?"
40 REPEAT
50 INPUT A$
60 UNTIL A$="NAME" OR A$=
"ADDRESS" OR A$="PHONE"
70 PRINT "Section recognised!"
```

Line 60 treats each string as if it were a number, using the equals sign to test each possibility against the string you typed in.

We can shorten line 60 quite a bit to quicken things up. As each section starts with different letters, ie N, A and P, the command GET$ can be used. This acts a little bit like INPUT except it just waits for you to hit a key and then thunders on its way. Retype lines 50 and 60 of the above program as follows:

```
50 A$=GET$
60 UNTIL A$="N" OR A$="A" OR
A$="P"
```

Typing the first letter of any section will cause the program to move on, and there's no need to press that awful Return key!



A similar command (GET) exists that deals with the numbers relating to the key pressed. For example, the number, or ASCII code, for the letter A is 65, and this could be tested for using:

```
10 CLS
20 REPEAT
30 A%=GET
40 UNTIL A%=65
```

A full table of the ASCII codes relating to each key on the keyboard can be found in your User Guide, so have a look.

The problem which often arises with all types of input commands is that they quite often fail because your micro might not be in the character case you require, eg, you might be testing for the A key but if the 'Caps Lock' light is off the computer is seeing a lower case 'a'. Being able to get round this problem is useful to say the least, and the most obvious solution is to test for upper and lower cases:

```
60 UNTIL A$="NAME" OR A$=
"name"
```

and so on. This is long winded though, and doesn't test for mixtures of upper and lower case characters.

Another way is to 'force' lower case to upper case. The term force means what it implies – if it is lower case then make it upper case! Enter the following program to see just what I mean:

```
10 CLS
20 REPEAT
30 A$=GET$
40 UNTIL A$>"@"
50 X%=ASC(A$)
60 X%=X% AND &DF
70 PRINT X%
80 PRINT CHR$(X%)
```

After typing RUN, press the caps lock key to get into the lower case character set. Now press the 'A' key. The value 65, and the character itself, has been changed to upper case. The program waits for you to press a letter key that is 'greater than' an @ key (line 40). The key which is stored as a string in A$ is then converted into an ASCII code, using the ASC command, which is placed in the variable X%. The lower to upper case conversion is then performed in line 60. This involves using a logical operator, AND, to play around with the ASCII code of the letter (using the &DF) to ensure it's in upper case.

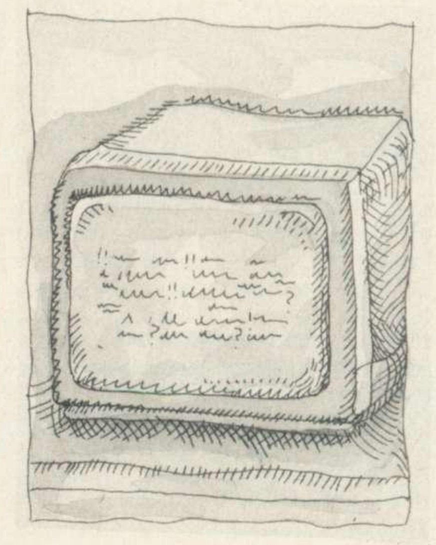
Another useful command to test for either case characters, and then act on the information directly, is INSTR (pronounced 'instring') used in conjunction with GET$. Here's a typical application:

```
10 CLS
20 P."Do you wish to continue Y/N";
30 ON INSTR("YNyn",GET$) GOTO
50,60,50,60 ELSE GOTO 30
40 :
50 PRINT"Yes":END
60 PRINT"No":END
```

The INSTR command looks for the occurrence of one string within another. Here the search string is in the command GET$, so the command waits, looking at the keyboard. When a key is pressed it looks for this in the source string, which in this instance is "YNyn". If it is located it gives its position a number; "Y" would be 1, "N" would be 2, and so on, as we are using the ON...GOTO sequence. This number is then related to the position of the line numbers after the GOTO command. Thus ON finding the letter it can GOTO the corresponding line number. If the letter is not located in the string then the ELSE is performed.

This technique is extremely useful for setting up menu screens as it accepts only the correct letters and then determines the next part of the program to be accessed.

Next time we'll examine how we can actually play around with characters in a string using LEFT$, RIGHT$ and MID$ commands.



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We've reduced the price of our RGB high resolution colour monitor (580 x 470 pixels) to only £199.95 – that means you save £50 on our previous offer – and that includes VAT, leads and carriage.

And just because you're saving on price doesn't mean you're sacrificing quality. Here's what Acorn User had to say about our monitors.

"...Gave steadier pictures than the Microvitec Club, and the colours were rather better.

It seems that all 'normal' and 'medium' resolution monitors, including the Sanyo, are simply inadequate to deal with the Beeb's graphics and text output.

The JVC was excellent, giving clear, legible results.

Was the JVC better than the Microvitec?* Would I buy one? Yes to both questions."

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Name________

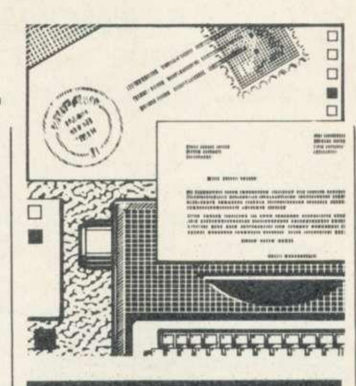
Address________

Postcode________

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Databases disturb a hornet's nest

Sir, As a completely non-technical user of home computers, dependent on commercial software, I was interested in your review of the six database packages, particularly *Masterfile* which I have recently tested. I cannot say that I have given it a thorough workout but I am surprised your reviewer did not comment upon two silly weaknesses.

It relates to its handling of numeric fields where I think more could have been done to help the user, as follows:

All least significant zeros after the decimal point, even if keyed, are dropped during printout, causing a very ragged and hard to follow presentation. If nothing else, at least decimal points should be vertically aligned.

For reasons best known to the programmer, *Masterfile* deducts, apparently randomly, 0.0001 (or similar, depending on field length) from specifically keyed data. There is a comment on page 12 of the booklet about minor binary differences but this is referring to certain in-built calculations. If the data keyed by the user is not safe in the hands of the program, I would have thought that is putting the machine before the user and a serious deficiency.

If it is a technical thing we users have to put up with, why was it not explained?

In the meantime, I look forward to more reviews of non-games software.

G A Upton
Merseyside

Sir, I eagerly awaited the comparative review of databases but was very disappointed when it appeared. It was far too short to be really useful – a page on each would have been more realistic – and omitted Acorn's own offering as well as Computerwise's *Data Minder* which, from its specification, must be one of the most interesting, as it allows simultaneous access to multiple files.

Only a complete novice would have learnt much from your review. The more experienced are equally in need of information as they are no more able to buy and try everything on the market. As *the* magazine for BBC users, please try to be more definitive in your reviews. If *Elite* rated a whole page in the October issue, then surely the fundamental packages – spreadsheets, wordprocessors and databases – rate at least one page each.

A S Blench
Bucks

Sir, Further to my letter (*Acorn User* October 1984) may I say that I have appreciated the comparative reviews of the Turtle family and the databases; particularly as the reviewer of the latter, Vincent Fojut, confirmed my faith in *Beta-Base* as an easy to use, and good value for money database.

Having said that, would you not consider there to be a responsibility on the part of the reviewer to be accurate, particularly when comparing a number of similar products. My own experience of *Beta-Base* indicates that there is not one single search field, but a maximum of five, more than one of which can be carried out on the same field, for example using < and > relational operators to search for dates of birth between specified dates. One has to acknowledge that the sort facility is restricted to 500, but of course there is no limit, to my knowledge, of the number of records that can be searched.

I am sure that your reviewer must have had the earlier version of *Beta-Base*, as the enhanced version certainly has the facility to spool files into a wordprocessor, and has added the facility of global entry or edit.

Keep up the high standard you have set yourselves: you present a magazine of quality.

David Powell
South Yorks

Sir, Your readers may like to know that *Profile* from Haikusoft has been considerably updated and is now published under the name *Psifile* by Sigma Press. 'Wild-card' searches and improved printout facilities especially suited to mailing lists are among the additions. It is available either on disc at £19.95 (BBC model B) or cassette at £9.95 (model B or Electron).

Graham Beech
Sigma Press

Vincent Fojut replies: I regret the confusion over *Beta-Base*'s search facility. Although the text gives the wrong impression that searches are limited to a single field, table 2 (p.155) correctly shows that up to five fields may be used. Also, by specifying the same field more than once in a search, the 'AND' function may be simulated (but not 'OR').

My article does clearly state that, although *Beta-Base*'s search and sort lists are limited to a maximum of 500 records, the number of records on a file could be higher. So, if more than 500 records in a large file satisfied a given search condition, the search would finish prematurely. Readers would have to decide for themselves whether this is important in their application.

To quote from my review, it was 'not intended as an exhaustive comparative review, but outlines the typical features you are likely to come across, with an indication of how they compare.' Those who feel that the piece was too short, or ignored certain packages, have missed the point. Although it was self-contained, consider the article also as the 'groundwork' for any further 'in-depth' database reviews that may appear in *Acorn User*. I hope my article helps to put in perspective the concepts and facilities covered in any such future reviews, as well as helping those who are already considering a purchase.

Since writing the review, both Beebugsoft and Clares have announced enhanced versions of *Masterfile* and *Beta-Base* respectively. Both packages boast several new facilities, many of which correct shortcomings outlined in the review: eg, *Masterfile*'s sort speed is now much improved; *Beta-Base* now allows SPOOLed output, etc. Prices remain unchanged in both cases. Clares offer to upgrade discs if returned with a cheque for £3. Cardiff Micro Software have slashed the price of their *Datafile* package from £49.50 to £24.15. This brings it much more in line with other disc-based products, and obviously qualifies some of the observations in the review.

Hospital says thanks AU

Sir, Recently you published a letter in which I requested help from your readers in developing software for handicapped children. May I now thank your readers for their most generous and enthusiastic response. We have had so many letters that I have not been able to reply individually to each one, but will be contacting some readers very shortly with detailed specifications for new ideas.

It's nice to know that there is so much enthusiasm to develop new applications for computers, and the generosity of your readers in offering to give their services free of charge was very refreshing.

Dr David Hall
St George's Hospital
London

Compendiums could cut costs

Sir, I am amazed that none of the larger software companies have yet produced any 'games packs' on 40 or 80 track discs.

Surely the likes of Acornsoft could put six or seven games on one disc, keeping the price to a minimum and providing a good service to people who don't have any software on disc.

I am positive this could be a great success especially if there was a price incentive; say a disc of eight for the price of four or six individual games.

Maybe someone will jump on the proverbial band-wagon and take a lead in this field.

John Kirkby
United Arab Emirates

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ASK a silly question, pass a fair comment, stage an angry protest – we don't mind what you write to us about (or about us!). Keep 'em short, keep 'em sweet, but keep 'em coming! The address is: Letters, Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH.

Seconds out for View versus Wordwise

Sir, Your article on wordprocessors in the January issue of *Acorn User* contains some very good advice for prospective buyers but suffers from inaccuracies and the inclination of the author to favour *Wordwise* because that is what she is used to. Some of the good features mentioned for *Wordwise* apply equally to *View* (flexible, fast text movement; file merging; producing simple documents quickly; printer control) while criticisms of *View* apply equally to *Wordwise* (numerical information on rulers, overwriting existing files).

Taking the various points raised about Acornsoft individually:

The various comments about printer drivers are completely inappropriate given that *all* our advertising states the position on printers very clearly and this information is repeated on the back of the *View* pack. There is no difference in the printer driver interface between versions 1.4 and 2.1, which both accept extended sequences.

We have not put numerical information on the rulers or cursor because the *View* philosophy is not to clutter up the screen with largely irrelevant information or irritating, forever changing numbers. The user is given as much room for text as possible without the distraction of *View* fiddling around all over the screen.

The problem of not overwriting an existing file is really a filing system rather than an application problem, which is partly why many other applications as well as *View* do not resolve it. Most users find that the ease of saving an already correctly named file by just typing SAVE is preferable to instructing the computer twice to do a simple operation. With *View* you can also see the catalogue on the screen as you are saving the text, which helps reduce error.

LS2 produces triple spacing because the 2 is the number of blank lines inserted between text lines.

The method of text recovery after hitting Break (an exceptional move) is not deeply buried. You simply type OLD.

Finally, Acornsoft are committed to supporting and developing the whole *View* range. We are investing ever-increasing resources to the development of new *View* products and to improving existing ones.

Robert Macmillan
Business Group Leader
Acornsoft

Jaquetta Megarry replies: It's untrue that I favoured *Wordwise* because I was most familiar with it. I spent much time getting to know *View*, but it's a case of horses for courses, and *Wordwise* suits my needs best.

The points raised about good features of *Wordwise* also applying to *View* and criticisms of *View* being relevant to *Wordwise* are correct, but my review explicitly stated this was the case in the tables.

I think it was valid to comment on the printer drivers as it affects cost comparison, and I didn't imply that Acornsoft mislead buyers about the position.

According to the review copy I received, the point about versions 1.4 and 2.1 is untrue, but the documentation with my package was incomplete.

Regarding *View* not printing numerical information on rulers or cursor, this could be made available on request only, like line numbers in *Wordwise Plus*.

I don't agree that most users find it easier to save a correctly named file by typing SAVE, and, although you can see the catalogue on screen as you are saving text, I would still like to have a safety-net.

The details of how to recover text after hitting Break are vital to beginners so why not include it in *Into View?*

Tell us about the 6502

Sir, Software and firmware reviewers please take note. Now that the 6502 second processor is becoming more in demand please indicate if software under review, whether in disc, tape or ROM format, is compatible with it. It would be most disappointing and annoying to find that the expensive software/firmware you have purchased bombs out when in the second processor.

Program writers contributing to *Acorn User* could also indicate any listing modifications required to enable it to run in the second processor, if possible, as is generally done now for Basic 1 and 2.

Advertisers too should realise it would be a major selling feature if they could state that their programs are 6502 second processor compatible.

R Immelman
Somerset West
South Africa

Atomic wasteland

Sir, I picked up January's copy of *Acorn User* from my newsagents expecting to find Atom Forum in its usual place, but no matter how hard I searched, I could not find it anywhere. I was amazed to discover in 207 pages of your magazine, the only mention the Atom received was in the Free Ads at the back. The front of the magazine states that the information inside is for the 'BBC micro, Electron, Atom'.

Isn't this a bit misleading to Atom owners who, after having gone out and spent £1.20 on *Acorn User*, find that there is nothing for their computer.

I hope that you sort this matter out soon, or you should have quite a few angry Atom owners writing to you.

D W Hewitt
Shropshire

See page 128 for a new style Atom Forum.

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Stopwatch on second processors

Sir, I read Paul Beverley's article on speeding programs up (*AU*, December 1984) with some interest. I have just taken delivery of an Acorn Z80 second processor, and decided to run the benchmark tests referred to for myself. My results for the three versions of Basic are shown in the table. The Benchmark 8 test which I ran seems to differ from the one used by Paul Beverley, but the results still provide a useful comparison. The BBC micro timed itself for the first two sets of benchmarks, while the third set, using Professional Basic, was timed with a stopwatch and therefore probably errs on the slow side.

I then tried the test to detect phantom interrupts, and was appalled to discover that my Beeb-plus-Z80 combination returned a result of 191.44, whilst the Beeb clocked just 88.05 with the Z80 switched off! Perhaps one of your resident experts could enlighten me as to the reason for these results.

Professional Basic (PBasic) provided with the Z80 is a run-only version. This means that programs cannot be written directly and then run, as in BBC Basic. In fact, direct mode in PBasic appears to accept only one command, SYSTEM, which returns the user to CP/M. The manuals suggest using *MemoPlan*, the word-processor provided with the Z80 pack, to write source programs in PBasic. However, I have found that it is possible to write programs under BBC Basic, using the AUTO line-numbering command, and ensuring that only keywords permitted in PBasic are used. Once the file has been saved, exit to CP/M and CONVERT the file from internal format (extension .BBC) to an ASCII file (extension .BAS). The resulting program can then be run under PBasic.

I enjoyed the articles on the Z80 by John Vaux (*AU* July to September 1984) and hope that you will publish further items on the Z80 second processor, CP/M software and languages.

Stephen MacLeod
Evatt
Australia

BBC BENCHMARK RESULTS

	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8	Avge
BBC 6502	0.7	2.8	7.8	8.3	8.8	13.5	20.9	48.2	13.9
Z80 Basic	0.5	2.0	7.1	7.5	8.0	11.5	16.7	21.2	9.3
PBasic	0.3	1.6	4.4	4.7	5.0	8.5	13.7	16.4	6.8

Elite fiddles – the harmless and the deadly

Sir, In the early stages of *Elite* when you are only equipped with a 'front pulse laser' – if the player gains enough credits to be able to purchase another laser and accidentally selects F (for front) instead of one of the other choices, then the program immediately credits the player with 260.1 CR. You can continue to do this over and over again, increasing the credits held. Obviously this allows a player to develop a vast amount of wealth very early on in the game (in my case 100,000 CR in approximately 20 minutes) and then to equip his/her ship with all possible weaponry, etc. You can then pursue a strategy of attacking everything that you come across – rapidly improving your rating (in my case from 'mostly harmless' to 'dangerous' in a little under four hours).

Mr Thareec
London

Sir, Having overcome a slight problem I had with my disc (original!) copy of *Elite*, which crashed fairly frequently on docking or hyperspace, I thought readers might like to know of a fool-proof solution.

The problem seemed to be caused by reading data off the protected program disc. This can easily be remedied by copying the data files onto a normally formatted disc. Simply type *COPY 0 0 D.* and *COPY 0 0 T.* You will not be able to BACKUP the original due to its protection.

If using dual drives your task will be a lot less laborious as there are 18 files to copy! Once completed, however, the main program can be loaded as normal off the original disc, and the one with the copied data files used in its place from then on.

One word of warning! The original problem (ie, the screen filling up with a load of rubbish on docking, etc) seems to recur if you save another file (even a commander) to this disc.

I hope this relieves considerable frustration previously experienced by myself and several others on what is otherwise a truly excellent game.

Commander Wycliffe (Deadly)
Slingsby

Sir, It may be of interest to fellow Beeb owners that Acornsoft have taken the view that all disc drive owners use only the Acorn DFS in their marketing strategy for the excellent game *Elite*.

I, and many others, like to match the excellence of the Beeb with the best that is available in support systems; and have bought a DFS that gave better facilities than the Acorn product – in my case Watford's DFS. Unfortunately, the disc version of *Elite* does not run under Watford DFS – nor, I believe, under Pace.

On phoning Acornsoft, I received only the advice that the game had been written with the Acorn DFS in mind,



not other DFS's. I asked whether it was not felt that some hint of this parochial view would be a good idea in the advertising copy of *Elite*, but this didn't go down at all well!

In my view, Acorn are going to lose out; given a choice of a good game or a good DFS, the latter takes preference. If game sales are to be maximised, all Acornsoft have to do is be a little less clever in their programming routines – we could all then enjoy the game as well as our choice of DFS.

I only hope that this letter serves as a warning to any budding *Elite* owners – your dealer may not be as sympathetic as mine, and £17.65 is a lot to waste!

B G Hulatt
Middx

Sir, All too often, we hear of people griping about software piracy. I would like to put a different perspective on this issue, as I consider myself a victim of software protection!

I recently fitted a Microware double density disc interface to my BBC and must say that I have been completely satisfied with its performance and its ability to access standard Acorn discs.

However, the problem arose when I decided to invest, along with a host of other BBC owners, in the new Acornsoft production, *Elite*. Having paid £17.50, I got home, powered up my BBC and inserted the new disc. After several valiant attempts by my nice shiny new disc drive to wrap its read/write head around the drive spindle, I realised that something was amiss! This was eventually tracked down to the method used by Acornsoft to protect their product – namely by the deft use of some rather obscure 8271 FDC commands (the DFS in my machine uses the 8272).

After much investigation on my part by searching out data on both the 8271 and 8272 FDC's and digging around in the offending Acornsoft code, I eventually had to concede defeat and return the package to my friendly dealer. I must admit that I bought the game under the agreement that if it would't load, I was sure of a complete refund, but I feel it's a poor state of affairs when software houses have to go to this length to avoid piracy of their products.

This episode has resulted in me now being extremely reluctant to purchase commercial discs – all because I decided to go for a nonstandard upgrade. I suppose I could have purchased the game on tape instead, but to disc then have to transfer it to disc (where I wanted it in the first place) would be regarded under the current copyright laws as a criminal offence.

I rest my case.

David C Morris
Sheffield

John Collins of Acornsoft's Technical Services replies: Our policy is to try to support any DFS the user might have in his machine. If DFS manufacturers keep us supplied with current versions of their products we will do our best to make our software protection compatible. Some manufacturers have been co-operative in this matter and others have not even bothered to answer letters from us.

We only guarantee to support Acorn DFSs and strongly recommend users not to buy a non-Acorn DFS. The problem with some is that they do not properly emulate OSWORD &7F calls, in which case we can do nothing short of rewriting their DFS for them.

Our protection did work on the Watford single density DFS a few months ago. Mr Hulatt may have another version of the Watford DFS or a Watford double density DFS, neither of which we have seen.

As far as *Elite* is concerned in no circumstances should one attempt to save Commanders back to the program disc as they will render it useless.

In answer to a point other *Elite* addicts have brought up, yes, Watford ROM Manager does make you Elite as soon as you take off. However, this will not help anyone win the competition as we can tell the real Elites from the rest.

Mr Thareec's correct in saying that in early BBC disc versions of *Elite* one could unfairly build up vast sums of money quite quickly. Again, doing so would not help anyone in the competition as we can tell the difference. If anyone is very unhappy about this they can have their disc replaced by contacting Acornsoft, but they might find it interesting to have one Commander who cheats and another who 'plays the game'.

All sorts of sorts

Sir, I'd like to comment on George Hill's article 'See how they sort' (*Acorn User*, October 1984), and the improvement proposed by Susan Jones in the Letters pages of the December issue.

In the initial 'unadorned' shell procedure line 530 can be deleted. If you are not sure that the number of items to be sorted is larger than null, add line 505:

```
IF max < =0 ENDPROC
```

Although I liked Susan Jones' letter very much and agree entirely, I propose to replace line 510 with

```
inc=2^INT((LN(max/2))/LN(2))-1
```

which calculates the initial distance with less instructions.

Michel Moes
Luxembourg

page 57 ▶


STEVE JACKSON'S
SWORDMASTER
SERIES
The definitive role playing adventure from the pen of the world's leading author and the keys of the world's leading software house.
In your High Street shortly.
Adventure INTERNATIONAL TM
85 New Summer Street, Birmingham B19 3TE Tel: 021-359 0801

CENTRAL PROCESSING... CENTRAL PROCESSING...

S Rawal, London N3
We will be carrying comparative reviews of both ROM boards and single and double density disc interfaces in the near future, as well as a ROM compatibility chart.

It is unlikely that most DDFS would be compatible with the APTL board, due to fitting difficulties.

Ruth Astall, Oxford
We suggest you take your Saisho tape recorder back to the store where you purchased it and ask them to test it on one of their BBC micros. Problems can occur due to bad head alignment and can be cured simply by adjusting the tension spring which controls the 'height' of the recorder head. Martin Phillips has covered the subject of loading and saving programs extensively in Hints and Tips, July 1984.

C Mathews, Wolverhampton
Fortran is available on the BBC micro from Acornsoft. It's included in a package called 'The P System' along with UCSD Pascal. It costs £299, is available on disc and requires a 6502 second processor.

C Lock, Bristol
A line was missed out of the 40/80 track solution presented in the August 1983 issue. The missing line is:

610 =X%?T%

A Hilton, Hartley, Kent
The August 1984 issue of *Acorn User* carried an article, 'Downloading the Weather', which contains details on the equipment needed to use a BBC micro to receive satellite transmissions.

John Lloyd, Banbury
There are numerous beginner's books available for the BBC micro. Titles that you might find useful are *Step by Step Programming for the BBC Micro* (books 1 and 2) by Ian Graham, published by Dorling & Kindersley, 1-2 Henrietta Street, London WC2, and *BBC Basic for Beginners* by David Smith, published by Melbourne House, Youra House, Castle Yard, Richmond, Surrey.

Books are very personal affairs, so I would really suggest you go along to a good computer bookshop and see what's on offer, and more importantly, what suits your own taste.

Simon Hicks, Hitchin
Atom Software is available from Bear Hardware, 68 Harmondsworth Lane, Harmondsworth, Middx UB7 0AA, tel: 01-897 3059.

Geoff Smith, Riyadh
We hope to be able to supply a compendium of past magazine listings on cassette soon.

W Shore, Abingdon
The error in the 'Shine A Light' article in the March 1983 issue was that a Schmitt receiver (RS 303 270) should be used and not a pin photodiode as originally printed. The corrections were printed on page 16 of the May 1983 issue.

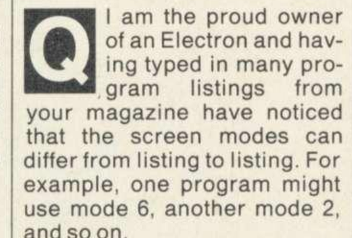
D Anderson, Chesham
It should be possible to run a Commodore 4023 disc drive on a BBC micro. However, the hardware and software required to facilitate such an interface would be both complicated and expensive. The Commodore drives are also renowned for their slowness of operation. We would advise against such a project and suggest you purchase a more normal BBC compatible drive.

Gary Truman, Cardiff
Harry Sinclair's sprite 'Mover' program contained no bugs. However the listing produced was incorrect in that the pound sign should read hash, ie #. So replace all pound signs with hashes.

Due to the large amount of technical enquiries we receive in the *Acorn User* office we are now unable to reply to individual letters. However, this new feature is intended to answer as many of your queries as possible, and should provide a useful information spot. Please keep your letters short and to the point.

Kitty advises on screen modes and cassette to disc transfer





Q I am the proud owner of an Electron and having typed in many program listings from your magazine have noticed that the screen modes can differ from listing to listing. For example, one program might use mode 6, another mode 2, and so on.

This all seems rather confusing – could you possibly give me a layman's explanation as to why there are different modes and tell me which one I should use for my own simple programs?

Tim Rostron
Reading

A The screen mode used in programs tends to reflect what the program is doing. Basically there are two types of screen modes – those used to display text only and those used primarily to display graphics, with perhaps just a small amount of text. If you are interested in graphics then modes 0, 1, 2, 4 and 5 will be useful to you; modes 3 and 6 are for text only.

I'll take the graphics modes first. Whichever mode you choose will need some of your computer's memory – at least 10k in modes 4 and 5 and up to a massive 20k in modes 0, 1 and 2. If your program is very long it is unlikely that you'll have enough memory for the 20k screen modes, so you must use mode 4 or 5. If, though, your program is short, you could use the other modes.

The screen mode also reflects the number of colours you can use on the screen at any one time. If you require all 16 colours you will need to use mode 2. Modes 1 and 5 allow a total of four colours on-screen together, while in all other modes you can have just two.

The text modes simply reflect the number of columns and lines on the screen. Mode 0 can place 32 lines of 80 characters across the screen, while mode 6 is capable of displaying 25 lines of 40 characters. Colour is allowed in both text modes but is limited to just two colours.

If you own a Beeb you can mix text and teletext graphics in mode 7 using just 1k of memory and a full range of colours are also available. This very economic use of memory is made possible by the inclusion of a special chip within the Beeb – the Teletext chip.

Sadly the Electron doesn't have this chip so these mode 7 facilities are not available.

Q I have had my BBC micro for nearly a year and I'm thinking of buying a disc drive. I have built up a small library of programs on cassette which includes those I've purchased and listings I have typed in from magazines.

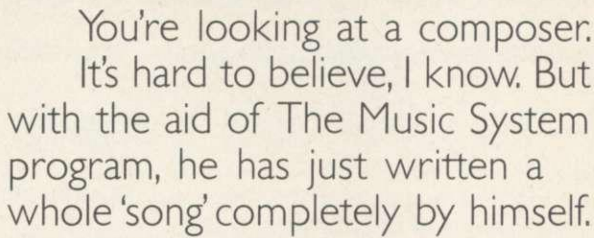
How easy is it to transfer these programs from cassette to disc? I am not interested in pirating a large quantity of copies but do not want to buy a disc drive only to find that I'm still reliant on cassettes for my existing programs, or have to buy additional disc copies of software I already have.

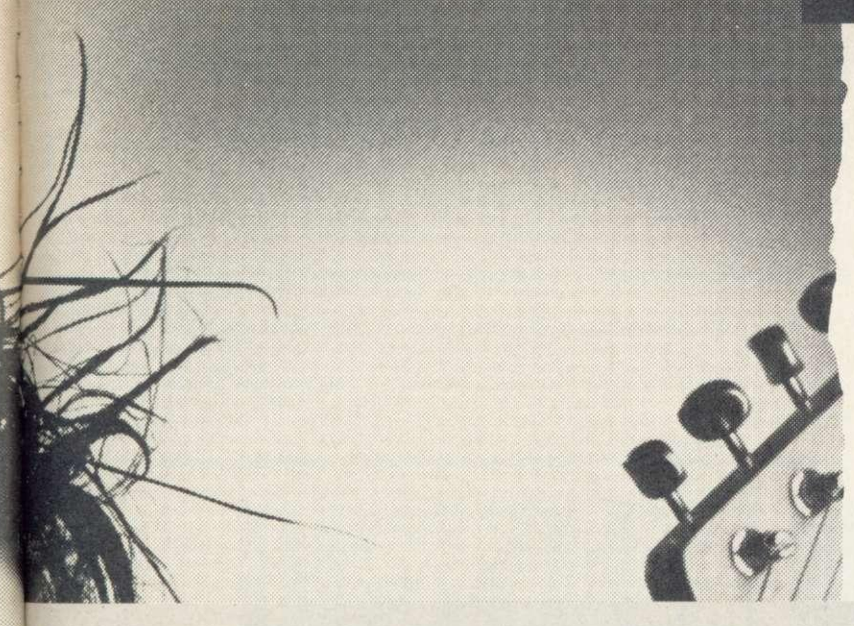
Alan Helmore
Dubai

A You will have no trouble transferring the programs you have typed in from magazines, except that you may have to alter the value of PAGE. The easiest way, however, would be to transfer them by using something like *Disc Doctor*.

As for the commercial programs – you probably won't be able to transfer these because of the protection that manufacturers build in, but some companies, such as Acornsoft, offer an upgrade service for very little cost.

I wouldn't let owning a cassette library put me off buying a disc drive – discs are so fast and convenient.





You're looking at a composer.

It's hard to believe, I know. But with the aid of The Music System program, he has just written a whole 'song' completely by himself.

Clever boy.

"Toxteth Dawn" is the name of the 'song'.

It's a love song.

Without any knowledge of music he bought the music system program, went home, booted it up on his dad's BBC B and started to create.

One finger and half a brain are all you need to make music on the new Music System.

He used the synthesiser part of the program to make a few noises. Added a pinch of an old song from the Song and Sound Library.

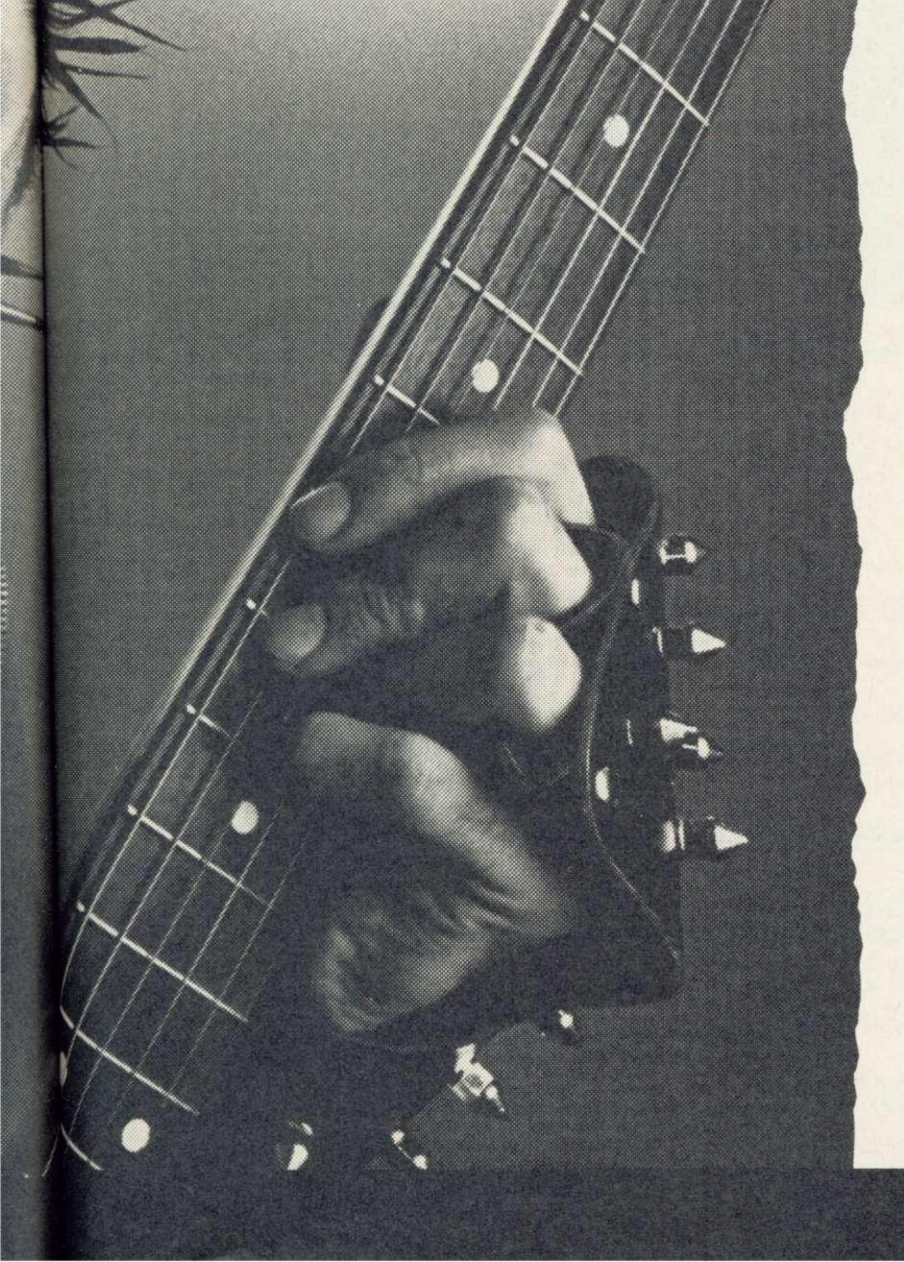
Laid down some percussion. And put a hint of bassoon and strings over the top.

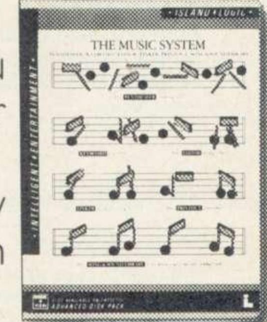
And hey presto.

The musical answer to zits. "Toxteth Dawn."

Because his dad's computer had a printer as well, the program even printed out the composition in full musical-manuscript form.

So he could show it to the rest of the band. And they could say. 'WOSSAT?'





Isn't it time you became a composer too?

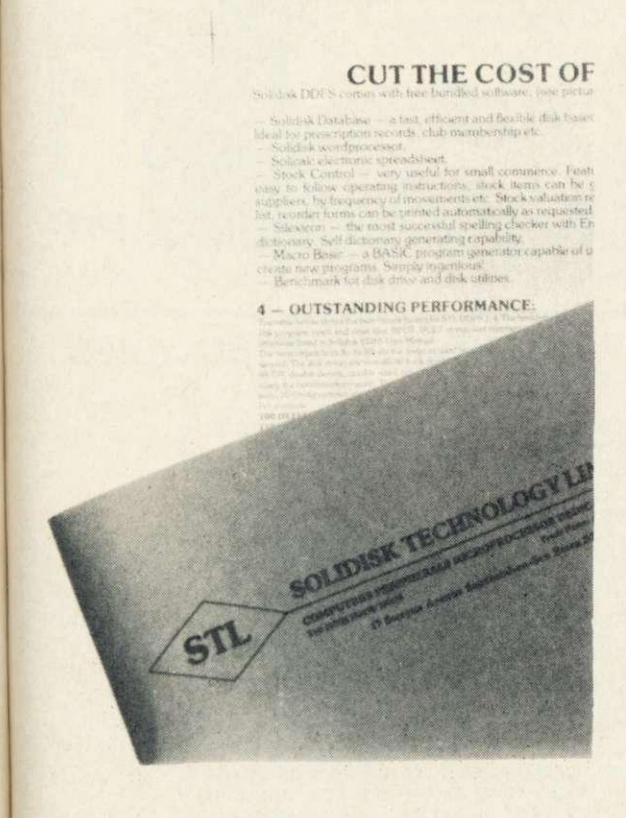
The brand new Music System from Island Logic.

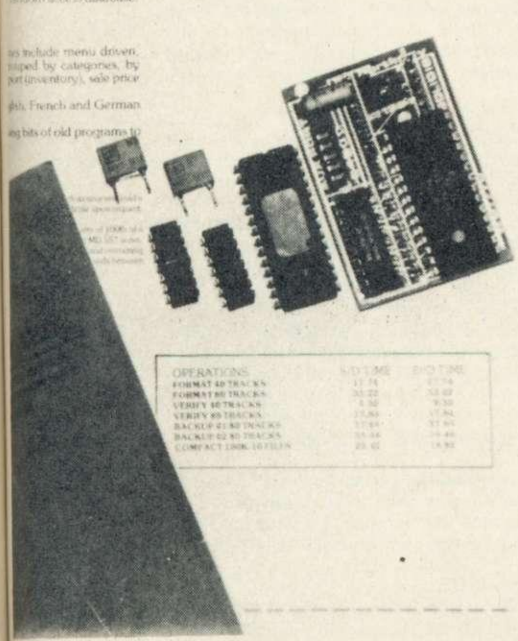
DISK PACK £24.95 INC VAT. CASSETTE 1 (SYNTHESISER, KEYBOARD, SONG AND SOUND LIBRARY) £12.95 INC VAT. CASSETTE 2 (EDITOR, PRINT-OUT, SONG AND SOUND LIBRARY) £12.95 INC VAT. PLEASE ADD £1.25 P&P PER ORDER AND SEND A CHEQUE/PO. ACCESS OR VISA CARD NO. WITH ORDER TO: SYSTEM, 12 COLLEGIATE CRES., SHEFFIELD S10 2BA. (CREDIT CARD HOTLINE 0742 682321).

THIS PROGRAM IS RECORDED ON THE HIGHEST POSSIBLE QUALITY DISKS, AS SUPPLIED BY MEMOREX

HAVE YOU ALREADY GOT DISK DRIVE(S) FOR YOUR BBC COMPUTER?

OPERATIONS	S/D TIME	D/D TIME
FORMAT 40 TRACKS:	17.74	17.74
FORMAT 80 TRACKS:	33.22	33.22
VERIFY 40 TRACKS:	9.30	9.30
VERIFY 80 TRACKS:	17.84	17.84
BACKUP 01 80 TRACKS:	37.69	37.69
BACKUP 02 80 TRACKS:	39.46	39.46
COMPACT 100K-10 FILES	22.42	18.82





THE SOLIDISK DOUBLE DENSITY DFS

If you take your Disk Systems seriously then there are very few viable alternatives to our new Double Density Filing System.

Anyone, with their ear to the ground, will probably have heard of the great shortage of the 8271 Floppy Disk Controller chip. This chip is, of course, the basis of all single density DFS upgrades for the BBC Microcomputer and is used extensively by Acorn, AMCOM and Watford Electronics in their respective DFS's.

This shortage can mean long delays or paying much inflated prices to obtain your Disk Upgrade.

Now, however, we at SOLIDISK have developed an alternative system with many advantages over the 8271 based upgrades. Not the least of these being continuation of supply of the FDC chip (Western Digital 1770) but, also, improvements in the speed and versatility of operation.

EASY TO INSTALL

The SOLIDISK DDFS comes complete with an easy to follow manual with step by step installation instructions, and can be fitted in just a few minutes by anyone with just the barest knowledge of the insides of their BBC.

The DFS contains just 4 IC's and 2 jumpers to be inserted and one link to be cut in the computer. This is compared to the usual upgrades which require 11 IC's to be fitted and the link to be cut.

EASY TO USE

The SOLIDISK DDFS Revision 1.5 contains many time and labour saving features. These include formatter, verifier, automatic density sensing, automatic 40/80 track switching and Single/Double Density mass copying etc.

COMPLETE CONTROL OVER THE DISK

SOLIDISK DDFS gives you complete control over your disk drive(s). You can use any combination of Single/Double Density, 40 or 80 tracks in one or two disk drives.

Every time the SOLIDISK DDFS accesses the disk it detects the density and the disc size in use and acts accordingly.
You can for example copy from a 40 to an 80 track disc on the same 80 track disk drive or even format a 40 track disk in an 80 track drive using the automatic disc size sensing in the DDFS. It is also possible to have one side of a disc formatted in Single Density and the other side in Double Density. Also copying between different densities is coped with automatically and, when using twin drives, is very fast.

GREATER DISC CAPACITY

When formatting a disk with the SOLIDISK DDFS you have a choice of the usual Single Density or the increased capacity Double Density.

Formatting in Single Density will leave your disk compatible with all other Single Density systems. However if the disk is formatted in Double Density it will have a 60% greater capacity than the equivalent size Single Density disk. This means that on an 80 track disk that the capacity is increased from the usual 400 kbytes to 640 kbytes of storage. The Double Density Format used is, at present, unique to the SOLIDISK DDFS and provides 16 sectors per track as opposed to the usual 10 sectors in Single Density giving a 40% saving in media surface for a file of given length over Single Density.

INCREASED SPEED OF OPERATION

As mentioned previously a disk formatted in Double Density uses about 40% less disk space per given length of file than does a disk formatted in Single Density or alternatively it holds 60% more information per track. This allows the, already fast, SOLIDISK DDFS to run very fast in the Double Density mode as demonstrated in the benchmark test on the next page.

BENCHMARK OUTSTANDING PERFORMANCE:

The table below shows the benchmark timing for STL DDFS 1.4. The benchmark consists of disk operations such as save and load a 16k program, open and close files, BPUT, BGET strings and numbers, format and verify a disk etc., and is available upon request, otherwise listed in Solidisk DDFS User Manual.

The benchmark tests B1 to B9 are the same as used by many reviewers. The time is expressed in seconds and parts of 100th of a second. The disk drives are twin 40/80 track double sided MITSUBISHI M4853, the diskettes are Verbatim Datalife MD 557 series, 96 TPI, double density, double sided, preverified to ensure that the media is free of all error and mechanical defects and containing solely the benchmark program. The test is loaded into memory, the drive motors are allowed to stop completely 2 seconds between tests, 10 timing samples are taken and the mean time is calculated automatically.
For example:

```
100 DEFFNb1:REM Save a 16k program.
110T% ÷ TIME
120 *SAVE A 8000 +4000
130 ÷ TIME — T%
```

Full listings are included in the User Manual.
This FN is called 10 times with 3 sec. interval, the mean result is printed as 'B1'.

BENCHMARK DESCRIPTION	S/D TIME	D/D TIME
B1 Save 16k	2.62	1.43
B2 Load 16k	2.45	1.23
B3 Openin and close 100 times	20.70	20.16
B4 Openout and print 1000 numbers (255)	5.84	4.66
B5 Openin and input 1000 numbers (255)	4.72	4.14
B6 Openout and print 100 80 bytes strings	6.18	4.91
B7 Openin and input 100 80 bytes strings	4.90	4.31
B8 BPUT 100 bytes (255)	3.01	2.06
B9 BGET 1000 bytes (255)	1.88	1.52

Note 1: Whenever a file is to be opened, STL DDFS automatically refreshes the disk directory, thus preventing erroneous disk change. Many other DFS's do not take the same care, although yielding a much shorter time, and this could accidentally stop the program.

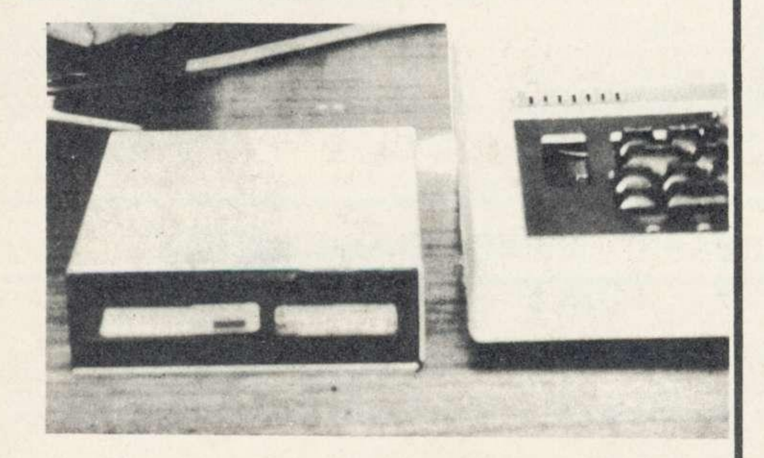
OPERATIONS	S/D TIME	D/D TIME
FORMAT 40 TRACKS:	17.74	17.74
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BACKUP 01 80 TRACKS:	37.69	37.69
BACKUP 02 80 TRACKS:	39.46	39.46
COMPACT 100K 10 FILES	22.42	18.82

With Wordwise:
Load 2000 words (17811 bytes) 16.80 sec. (41.40 sec. with AC).
With Scribe:
Count 2000 words (17811 bytes) 4.20 sec. (9.80 sec. with AC.90 DFS)
With Beebug's Masterfile:
Sort records 1 to 20 in PEOPLE sample database, the database is presorted on field 2 then the program is asked to sort on field 1, the time is then taken: 56.23 sec. (127.86 sec. with AC.90 DFS).
These timings are improved even further in double density mode.

The figures speak for themselves.

STL DDFS dramatically increases the operating speed of your software, including wordprocessors like Wordwise, View, Scribe, databases like Masterfile, Starbase etc.

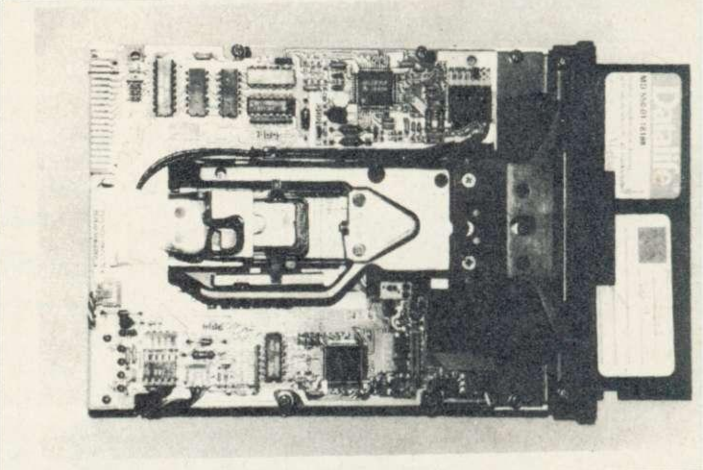
Solidisk engineers won't stop there.



MITSUBISHI DISK DRIVE:
From the new VLSI ultra quiet auto spin-up series comes the MITSUBISHI M4853. We have chosen it for its speed, quiet performance, low power consumption and state of the art design — look at the following features:
— new developments by Motorola and Mitsubishi largely reduce the area taken up by electronics, leaving more room for the diskette. This in turn implies lower noise levels and reduced friction on diskettes.

8 Slim 5.25" half height model attractively cased in BBC micro beige
— Reliability; we find that Mitsubishi compares most favourably with other makes
— Use your BBC own power supply —
— Single and double density available, plus ability ro read 40 track diskettes formatted elsewhere when used with our DFS.

Of course, we don't need to mention that all drives come complete with Dual leadds letting you add instantly a second disk drive and manual together with full guarantee on parts and labour.



EXTRA FEATURES OF SOLIDISK DDFS 2.0

With the production of the SOLIDISK DDFS 2.0 ROM we raise the already high standard of the previous DDFS 1.5 ROM.

The larger memory capacity of the DDFS 2.0 has allowed inclusion of a Wordprocessor and complete Disk Toolkit as well as a totally new concept in the working of the Disk Directory.

This will, we feel, make the SOLIDISK DDFS 2.0 ROM the most powerful Disk System currently available.

1) EXTENDED NUMBER OF FILENAMES
The standard number of filenames on the BBC microcomputer is limited to 31on most Single Density DFS's. This usually presents no problem on a system using 40 track drives but when using either 80 track drives and/or a Double Density Filing System this number will quite often be reached with a lot of the disk space still unused.

The SOLIDISK DDFS 2.0 ROM uses a unique and novel way to circumvent this shortcoming as every time a catalogue becomes full a new one is created. This gives the possibility of having up to 1502 filenames on a normal 80 Track Double Sided disk. Even with this large number of filenames worst case access taking only just over 2 seconds. Obviously with large files and a lesser number of filenames the access time decreases dramatically.

The way that the DDFS 2.0 ROM operates means that ordinary single catalogue discs are completely compatible with our system and, indeed, will be upgraded to multi catalogue once the number of filenames exceeds 31. This means no special formatting is necessary and that the disc remains compatible with other Single Density DFS's.

2) DISK TOOLKIT
Included on the SOLIDISK DDFS 2.0 ROM is a powerful disk repair facility. It is possible to read a complete track into memory and to repair or modify the data before restoring the track to the disk. If only one sector needs to be worked on then this too is possible with the Disk Sector Editor contained in the DDFS 2.0.

A powerful Disk Copy routine is also included to allow mmost non-standard format disks to be duplicated. This routine will also displaay the Sector I.D. Fields so that it is possible to see the makeup of the track being copied.

3) WORDPROCESSOR:
SOLIDISK DDFS 2.0 ROM contains a Word Processor with many excellent features such as 80 column screen, automatic on screen justification, Search and Replace, Block Move and Copy etc.

SOLIDISK+MITSUBISHI BIG DEAL:

This is exactly what you would receive:

— one double sided 80 track Mitsubishi M4853 disk drive, cased in beige.
— one Solidisk Double density disk interface (complete with STL DDFS 1.5 ROM) as described overleaf, giving a total capacity of 640K.
— Dual leads and instruction manual.
— 5 Software Diskettes containing a selection of the most prestigious programs written for the BBC.
— full one year guarantee.
—all for £209.95 including VAT and post and packing.

THE HARDWARE:
As described earlier and opposite.

THE SOFTWARE:
A selection of 6 programs based on ease of use, and popularity. All efforts are made so that you would not have to read the manual twice.
All programs feature on screen help (word processor) or option menus throughout. Mode 3 is used throughout whenever possible for good visual representation.

— Solicalc —
A Disc Based electronic spreadsheet made only possible with the speed of Solidisk DDFS. The sheet size can be as big as 170 kbytes. Written in modules, it is easily upgradable. Mode 3 screen. Goto, Calculate, Replicate, Automatic Header etc.

— Solidisk Datafile —
A fast, efficient and random access Database. Solidisk Datafile features:
— Compact size.
— 80 column screen throughout.
— 15 fields of 60 characters per card.
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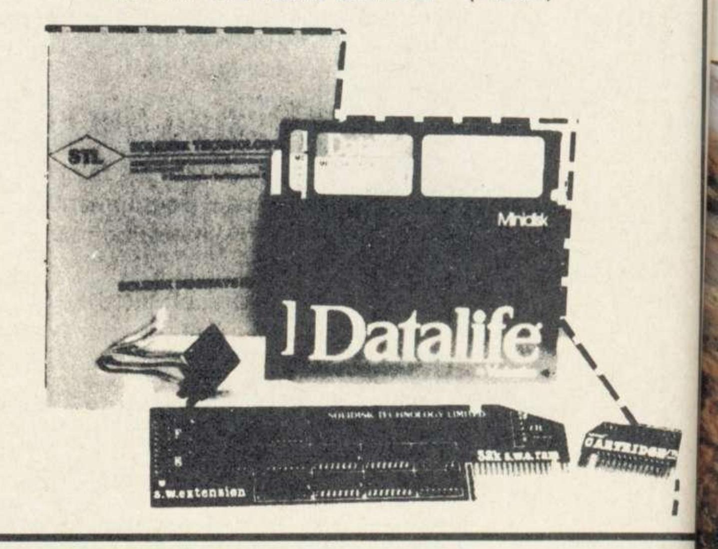
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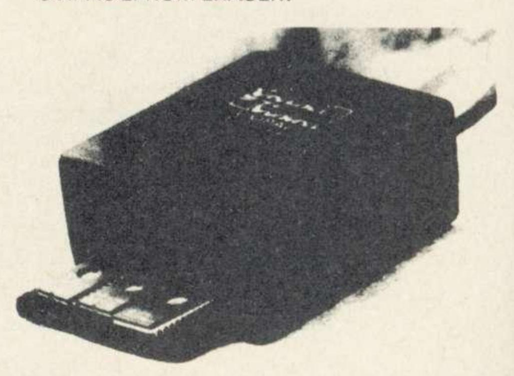
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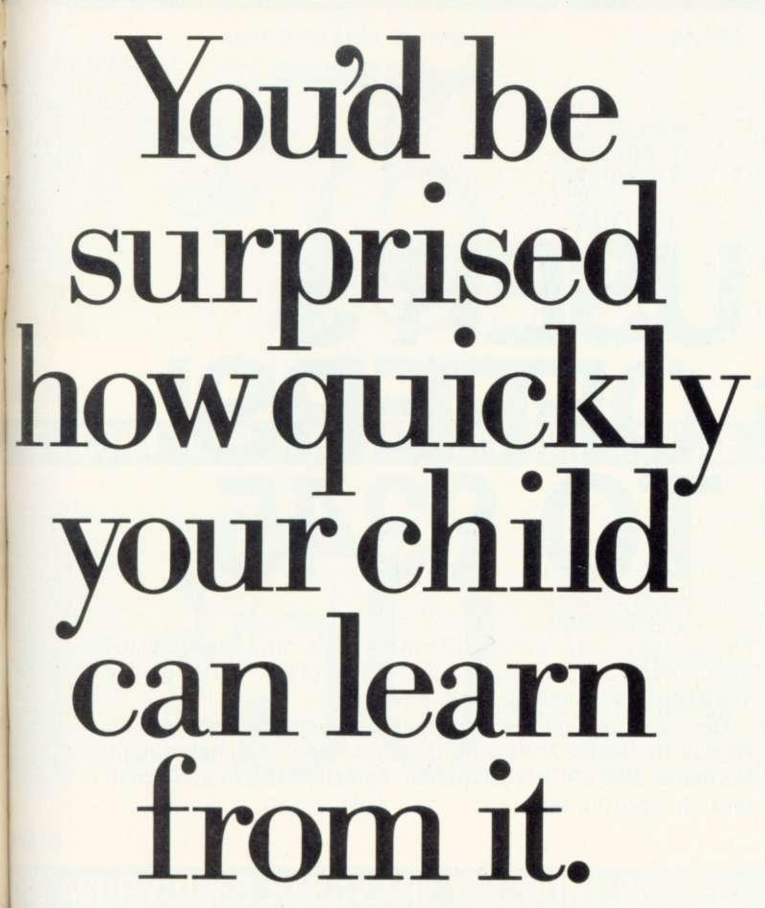


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Altra Probe is available in two versions. PROBE 1 and PROBE 2

ALTRA PROBE 2 IS TUBE COMPATIBLE

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First Aid 1.1 is an 8K ROM which contains 19 additional commands. They are: Machine code dissembler, Hex and ASCII dump. Sideways rom to ram copier, Function key predefined facilities, Variable table listing, Memory space free calculator, Checksum calculator, Rom lister, String search, Define function keys with strings, Rem and space Stripper, Bad programme fixer, Clear all variables, Clear ram from &0400 to &8000, Machine code monitor, First Aid 1.1 as a language, Lists O.S. calls with their vectors, Lists the first 24 control codes. Altra First Aid 1.1 was designed to assist the Basic / Assembler programmer and the sideways rom user.

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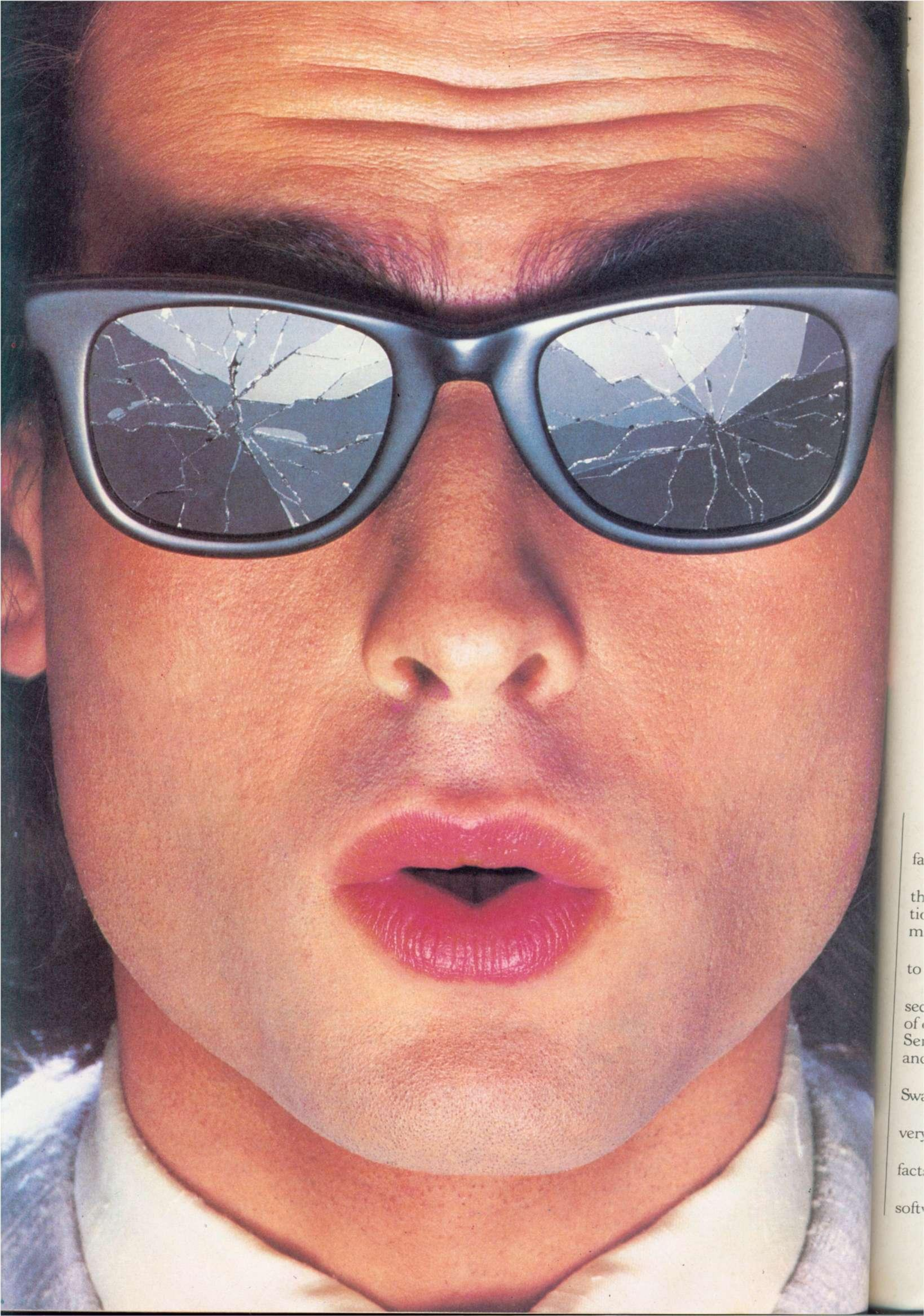
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Waterlooville. GB Microland, 7 Queens Parade, London Road. Tel: 0705 259911.

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Hitchin. County Computers, 13 Bucklesbury. Tel: 0462 36757.
Potters Bar. the Computer Shop, 107 High Street. Tel: 0707 44417.
Stevenage. DJ Computers, 11 Town Square. Tel: 0438 65501.
Watford. Laskys, 18 Charter Place. Tel: 0923 31905.
Watford. SRS Microsystems, 94 The Parade, High Street. Tel: 0923 26602.
Watford. Watford Electronics, Cardiff Road. Tel: 0923 405588.
Welwyn Garden City. DJ Computers, 40 Fretherne Road. Tel: 96 28444.

HUMBERSIDE

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Ashford. Geerings of Ashford, 80 High Street. Tel: 0233 33366.
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Bromley. Boots, 148-154 High Street. Tel: 01-460 6688.
Bromley. Computers Today, 31 Market Square. Tel: 01-290 5652.
Bromley. Laskys, 22 Market Square. Tel: 01-464 7829.
Bromley. Walters Computers, Army & Navy, 64 High Street. Tel: 01-460 9991.
Chatham. Boots, 30-34 Wilmott Square, Pentagon Centre.

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Gravesend. Gravesend Home Computers, 39 The Terrace. Tel: 0474 23871.
Gillingham. Regal Software Supplies, 49 High Street. Tel: 0634 579634.
Maidstone. Kent Micros, 51 Union Street. Tel: 0622 52784.
Rainham. Microway Computers, 39 High Street. Tel: 0634 376702.
Sevenoaks. Ernest Fielder Computers, Dorset Street. Tel: 0732 456800.
Shortlands. The Village House of Computers, 87 Beckenham Lane. Tel: 01-460 7122.
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Tunbridge Wells. Modata Computer Centre, 28-30 St. Johns Road. Tel: 0892 41555.

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Preston. 4Mat Computing, 67 Friargate. tel: 0772 561952.
Preston. Laskys, 1-4 Guildhall Arcade. Tel: 0772 24558.
Wigan. Wildings Computer Centre, 11 Mesnes Street. Tel: 0942 22382.

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Market Harborough. Harborough Home Computers, 7 Church Street. Tel: 0858 63056.

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W1. HMV, 363 Oxford Street. Tel: 01-629 1240.
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NW7. Computers Inc, 86 Golders Green. Tel: 01- 209 0401.
NW10. Technomatic, 17 Burnley Road, Wembley. Tel: 01-208 1177.

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Bolton. Computer World UK Ltd, 208 Chorley Old Road. Tel: 0204 494304.
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Manchester. Laskys, 61 Arndale Centre. Tel: 061-833 9149.
Manchester. Laskys, 12-14 St. Marys Gate. Tel: 061-833 0268.
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Liverpool. Laskys, Dale Street. Tel: 051-236 3298.
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Oxford. Science Studio, 7 Little Clarendon Street. Tel: 0865 54022.

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Glasgow. Boots, Union Street and Argyle Street. Tel: 041-248 7387.
Glasgow. Tom Dixon Cameras, 15-17 Queen Street. Tel: 041-204 0826.

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Telford. Telford Electronics, 38 Mall 4. Tel: 0952 504911.

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Stoke-on-Trent. Computerama, 11 Market Square Arcade, Hanley. Tel: 0782 268524.

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Ipswich. Brainwave Micros, 24 Crown Street. Tel: 047 350965.

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Epsom. The Micro Workshop, 12 Station Approach. Tel: 0372 721533.
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Wallington. Surrey Micro Systems, 53 Woodcote Road. Tel: 01-647 5636.

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Brighton. Gamer, 71 East Street. Tel: 0273 728681.
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Crawley. Gatwick Computers, 62 The Boulevard. Tel: 0293 37842.
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Newcastle-upon-Tyne. Boots, Eldon Square. Tel: 0632 329844.
Newcastle-upon-Tyne. Laskys, 6 Northumberland Street. Tel: 0632 617224.
Newcastle-upon-Tyne. RE Computing, 12 Jesmond Road. Tel: 0632 815580.

WALES

Aberdare. Inkey Computer Services, 70 Mill Street, The Square, Trecynon. Tel: 0685 881828.
Aberystwyth. Aberdata at Galloways, 23 Pier Street. Tel: 0970 615522.
Cardiff. Boots, 26 Queens Street & 105 Frederick Street. Tel: 0222 31291.
Cardiff. P & P Computers. 41 The Hayes. Tel: 0222 26666.
Swansea. Boots, 17 St. Marys Arcade, The Quadrant Shopping Centre. Tel: 0792 43461.

WARWICKSHIRE

Coventry. Coventry Micro Centre, 33 Far Gosford Street. Tel: 0203 58942.
Coventry. Impulse Computer World, 60 Hertford Street Precinct. Tel: 0203 553701.
Coventry. JBC Micro Services, 200 Earlsdon Avenue, North Earlsdon. Tel: 0203 73813.
Coventry. Laskys, Lower Precinct. Tel: 0203 27712.
Leamington Spa. IC Computers, 43 Russell Street. Tel: 0926 36244.
Leamington Spa. Leamington Hobby Centre, 121 Regent Street. Tel: 0926 29211.
Nuneaton. Micro City, 1a Queens Road. Tel: 0203 382049.
Rugby. O.E.M., 9-11 Regent Street. Tel: 0788 70522.

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Birmingham. Boots, City Centre House, 16-17 New Street. Tel: 021-643 7582.
Birmingham. Laskys, 19-21 Corporation Street. Tel: 021-632 6303.
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Walsall. New Horizon, 1 Goodall Street. Tel: 0922 24821.
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Wolverhampton. Laskys, 2 Wulfrum Square. Tel: 0902 714568.

YORKSHIRE

Bradford. Boots, 11 Darley Street. Tel: 0274 390891.
Leeds. Boots, 19 Albion Arcade, Bond Street Centre. Tel: 0532 33551.
Sheffield. Laskys, 58 Leopold Street. Tel: 0742 750971.
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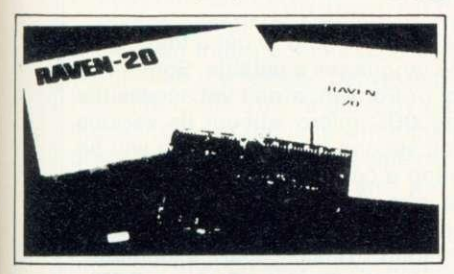
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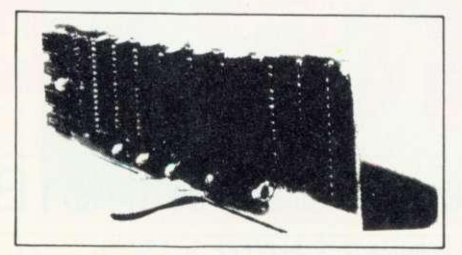
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MIND YOUR LANGUAGE

What languages are there other than Basic and why should you learn one? Joe Telford prefaces a new series

RECENTLY, at an international conference on using micros, out of a team of 10 guides only two or three could speak French more than passably, yet five thought of 6502 assembler as being their 'second language'. So the time seems ripe to look at the range of languages other than Basic available for the BBC; why you might want to learn another; and which would best suit your needs.

Since the late 1960s talking to computers has become easier. At around that time, the original Basic language was written at Dartmouth College in the USA, because students needed to learn computing by devising and running their own programs on the computer rather than having their programs run for them by an operator (batch processing). Batch processing still exists, but almost exclusively on mainframe (very large) computers.

Basic was one of the few interactive languages around when Altair, CBM, Apple and others began to build personal computers, and because of the ease with which it could be implemented and its apparent success, it became the resident language of all the early computers.

Basic has 'sort of growed' (just like Topsy) and manufacturers were afraid to produce a machine which didn't have the mythical standard Basic as a built-in feature, leading to the Basic snowball – every machine must have Basic because that's what everyone knows, because every machine has Basic. Changing a manufacturer's primary resident language from Basic is very difficult. A recent example is the Jupiter Ace, using Forth in ROM, which has not sold in the same quantities as the more popular micros.

So most people are stuck with Basic. The question whether or not they like it is not regarded as important, because many will not have heard of any other language. Having taken a good deal of effort to learn Basic, why should they then try to learn other languages? What value is there, for example, for the average user to learn Lisp? We need to have a good reason for using and hence having to learn another language.

Why learn another language?

The main reasons for learning another language are:

- It has features which a current language doesn't.
- A certain application requires a particular programming approach not available in the current language.
- It has improved speed, accuracy or memory usage.

A typical example is the user who can program competently in Basic, but who finds that a section of his program has to communicate with the outside world every 50 micro seconds. To solve this problem he or she will need to learn assembly language and understand something of machine code.

Another reason is that because microcomputer technology is advancing so quickly, the skills we learned as programmers five years ago are becoming outdated. Consider a machine which includes parallel processing and direct access to over one megabyte of user memory, as well as input by voice or mouse. OK, it isn't a BBC micro, but it could be an ABC (rumoured to be about two months from the shops). In five years (or less) who knows what the average £400 micro will consist of? One thing is sure. For those who want to be able to program such a beast, then the new skills will be those of structuring programs; structuring data; modularising inside and between programs; communicating between modules; writing for multitasking and transporting programs between machines.

Children are learning languages more appropriate than Basic to their stage of learning development, so they grow up to be very selective about their choice of language for computer dialogue.

What languages?

To be fair, we need to get a feeling for all the languages available. Some, like Cobol or Fortran, aren't yet accessible on the BBC micro without its various add-on second processors. We will be devoting a complete article to each of those already available for the BBC micro itself. The range of languages is quite long: Basic, 6502 assembler, Forth, Logo, Comal, Prolog, BCPL, Lisp, Pascal and Microtext. These can be split into two categories: low and high level languages.

Low level languages

Low level languages are those more easily understood by the micro than by man. They are usually input in mnemonic form using short code words which can be assembled directly into machine code. The program will mean little if read by the programmer, but will run quickly in the computer as it doesn't have to translate it into machine code. The Beeb has its own built-in assembler, which we can regard as the only true low level language on our list.

High level languages

The main characteristic of high level languages is that they are based on words or sentences closely allied to the English language and so are more easily understood by humans than by

the computer, but are slow to run. Importance is attached to performing a task with the minimum of programming effort, so, that many high level languages include techniques for looping, memory management etc. There are two occasionally overlapping subclasses: interpretive languages and compiled languages.

Most of the current high level languages for the Beeb are called interpreters. Their aim is to take a program written in a high level language and during its execution, translate it one line or block at a time into a machine code format, and then execute that small piece of code. This translation followed by execution is repeated until the program concludes. Interpreters are notoriously slow, although the BBC Basic interpreter is one of the fastest.

Compiled languages are not usually found on micros, because of memory restrictions. Where compilers exist, they are often afterthoughts. A compiler is a piece of software which takes a program written in a high level language and converts it completely to machine code, which can then be run. There are three main types of compiler: P-code compilers, compilers requiring a run-time library and full stand-alone code compilers, and users should choose one appropriate to their task.

P-code compilers translate the high level code into a compressed version which can be easily converted into machine code. This is done by part of the compiler at the time when the program runs. If you have this type of compiler you can write programs only for people with a matching compiler.

Some compilers include library routines for multiplication etc, which are supplied as a block of memory to be used at the time when the compiled code is run. Users with this type of compiler will need to license any programs they write from the compiler manufacturer, because they will be selling a block of the manufacturer's code with their own product.

While these types produce concise code, the stand-alone compiler often produces more expanded code which takes up a good deal of memory, although the code runs quickly and can be transferred between systems.

Any study of languages must also include compilers and interpreters, because the language type dictates its speed; transportability and memory requirements.

Forth

At about the same time that John Kemeny and Thomas Kurtz were producing Basic, Charles Moore was working on the Forth language. He needed a language to implement computer control of machinery, which was versatile, quick and simple. In machine terms even BBC Basic is slow at measuring and working in short time intervals. In its initial form Forth is not aimed at string or array manipulation, although these facilities can be added as the user's expertise grows.



Programs in Forth are created by defining a word in a particular way. Each new word becomes part of the Forth dictionary and is usually compiled on entry to it. Once a word has been created it can be used in the definition of other words. As each word is added to the dictionary, it takes with it the information as to where the compiled code is situated. This is in the form of pointers, and so one word can point to another and to a further word, before reaching the machine code core. These pointers form threads through the dictionary, and so Forth is called a 'threaded language'.

The main benefits of Forth include conciseness, speed because of its compiled nature, ease of writing because of its high-level nature, and structure.

The structure of Forth may not initially seem to be evident, yet because of its nature of defining words, Forth can be easily structured using a 'top-down' approach (ie, we start with the task to be undertaken and then acquire the tools to solve it, rather than by learning fundamental skills so that we can fulfil the task). If we decide that a particular program must solve a certain task, we can start by giving that task a name. As an example let's simply print a 7 by 10 block of stars on the screen. We can call the overall task 'BLOCK' and its aim is to print out a number of lines of stars. Call the task of printing one line of stars 'LINE'. LINE needs the assistance of a further word called 'STAR'. STAR's aim is to print a single * on the screen. We might imagine the structure looks like this:

(BLOCK calls (LINE calls (STAR) 7 times) 10 times)

although the program would be defined from STAR outward as follows:

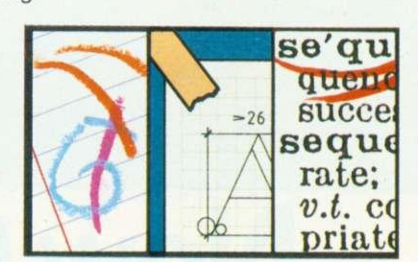
```
: STAR 42 EMIT ;
: LINE 10 0 DO STAR LOOP CR ;
: BLOCK CR 7 0 DO LINE LOOP ;
```

Typing BLOCK and pressing return executes the Forth program, which matches the Basic program:

```
 10 FOR I%=1 TO 7
 20 PROCline
 30 NEXT
 40 DEFPROCline
 50 FOR J%=1 TO 10
 60 PROCstar
 70 NEXT
 80 PRINT
 90 ENDPROC
100 DEFPROCstar
110 PRINT "*";
120 ENDPROC
```

Despite the 'new' vocabulary, it's very difficult to produce unstructured Forth programs because of the lack of line-number-oriented commands.

One of the problems which worries newcomers to Forth is its method of calculation based on Reverse Polish Notation. RPN was used on the older calculators because it is speedy when applied to a stack. In Forth, a stack is simply a temporary workspace for calculations. The stack format means that arithmetic is swift, but the way in which calculations are performed must be observed carefully. For example, 1+2 is entered as 1 2+ so that the items 1 and 2 go onto the stack and the plus sign adds the top two stack items. Forth has been around for quite a while, its number of devotees is gradually increasing and it is well worth examining.



Logo

One of the most fêted languages of recent times, Logo is regarded by many as the most appropriate language for early learning. Again, Logo is a language with its roots in the 1960s. It was designed in Cambridge, Massachusetts by Wallace Feurzeig, Daniel Bobrow and Seymour Papert. Seymour Papert in particular has done much to popularise the language through his lectures and writings.

Part of the reason for creating Logo was that programming might be an appropriate tool for children to use in exploring various learning environments. The language is intended to be adaptable to the needs of all children, and so is easy to use at the simplest levels, but capable of powerful processing for older children and adults.

One current school of thought suggests that in programming a child can

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develop skills, techniques and (more importantly) concepts which relate to a number of areas of experience outside the programming activity itself. The Logo philosophy suggests that some important skills a child needs might include thinking logically; thinking intuitively; solving 'real' problems; hypothesising and testing hypotheses; predicting, planning and sequencing information; and modifying solutions.

All these activities are part of the 'real' world, and perhaps use could be made of any agent which supports this type of learning. Logo was designed to allow such activities to take place within the realm of programming.

The first time someone uses Logo they often think it's a relatively trivial language whose whole aim in life is to draw lines on a screen, because the usual introduction to Logo is its turtle graphics, which are a major part of the language. A turtle can be directed around the screen leaving a trail as it moves. Its position is controlled by keywords like Forward, Back, Left, Right, Penup and Pendown. Until the development of 'proper' Logo, all the 'toy' Logos had relied heavily on the turtle graphics features.

Logo has its roots in the Lisp artificial intelligence language, and is heavily biased towards list processing. Items inside lists can be data or commands, and very powerful routines can be built up to process these lists.

The other important part of Logo is that new words can be added to it, but, unlike Forth, these are regarded as procedures. They can be called by name, but remain as separate entities ready for interpretation in the RAM space available to the user. Because of this, Logo is regarded as an interpreted language.

The benefits of Logo include its initial ease of learning; simple access to powerful facilities, eg, recursion; structured approach, preventing bad programming habits; automatic support of the problem solving approach; and fostering of the use of microworld environments. Its ease of use and structured approach mean that you can write programs which would be quite complicated in Basic in a number of seconds. Take, for example, this section of Basic which draws a circle:

```
9300 DEFPROCcircle (x, y, r)
9310 LOCAL z, x%, y%
9320 MOVE x+r, y
9330 FOR z=0 TO 2*PI+0.2
     STEP 0.2
9340 DRAW x+r*COSz,
     y+r*SINz
9350 NEXT: ENDPROC
```

In order to produce the program, the user would need to understand not only FOR . . . NEXT loops but also the concept of local variables, the commands MOVE and DRAW, the meaning of pi, a good deal of trigonometry, especially the application of trig to circles, and of course the meaning of radius, and its relation to a circle. The routine would then be called by the line: PROCcircle (640, 512, 200). This would draw a circle in the centre of the screen with a radius of 200 units.

The same program in Logo might look like this:

```
TO CIRCLE :size
REPEAT 72 [FORWARD :size LEFT
  5]
```

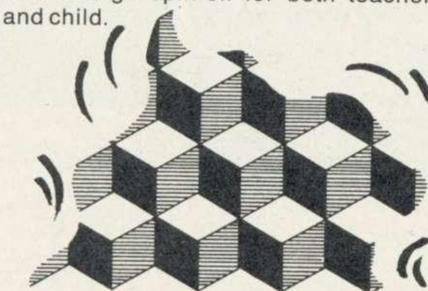
and could be called by a line: CIRCLE 20 which would draw a suitably large circle on the screen. The only concepts here are the understanding that a circle on screen is a duplicate of how a circle on the floor could be walked, and the Repeat loop. Forward and Left would, one hopes, be part of a user's previous experience.

Microworlds is an expression peculiar to Logo, because it describes the learning environment around a particular topic. For example, the Logo program below could be used by a maths teacher to let children explore the relationship between shape and angle:

```
TO SHAPE :angle :size
DOFOREVER [FORWARD :size
  LEFT :angle]
END
```

In this microworld the child can specify the length of a side and the angle of turn of the turtle. Every angle will produce a different picture. The teacher can direct the child's exploration of the microworld by suggesting avenues like: which angle produces a square? how can I draw a star? what happens when I use SHAPE 180 100? which angles provide a closed shape?

In terms of learning by discovery the programming effort presented here has a large spin-off for both teacher and child.



Comal

The *Com*mon *Al*gorithmic *L*anguage is a relative newcomer on the language scene. It was specified in Denmark by Benedict Loefsted and Borge Christensen in 1973 and has a growing following of devotees. It was based on the desire for a simple Basic-like language capable of encouraging problem solving at the level of more powerfully structured languages.

A typical comment from universities, higher education, and large companies involved with computing is that it is difficult to teach good programming practice to students who have been exposed to Basic as their initial language, as Basic has a weak structure, and a Basic 'standard' does not exist between machines.

Basic has been regarded as an all-purpose language, and this is one of the points in its favour. Comal is as flexible and simple to use, yet is capable of supporting the needs of programmers in the future either directly or by giving an introduction to the skills needed in using other languages.

When Comal was designed its models were Basic and Pascal. The result was a Pascal-like language which was rich in structures and yet had the flexibility of Basic. In many ways Comal is Basic plus a number of useful features, particularly in the area of loops and conditionals.

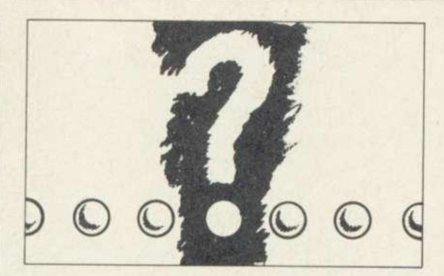
The benefits of Comal include: flexible Basic type environment; powerful structures available; no need for edit modes or program editors; supports modularity and transportability; and it eases the progression towards further high-level languages like Pascal.

For a programmer brought up on Basic, Comal is like a fairground packed with free rides. If the programmer takes time to explore the fair, all the old rides we know so well are still available but new ones have been added. For example the IF . . . THEN construction, which is complicated to use in Basic when several actions must take place, has become a multi-line statement:

```
1000 IF answer=correct THEN
1010 PRINT "WELL DONE"
1020 VDU7
1030 score:=score+1
1040 ELSE
1050 PRINT "TRY AGAIN"
1060 attempt:=attempt+1
1070 ENDIF
```

Also available are WHILE . . . ENDWHILE loops, methods of handling multiple IF statements, more powerful filing routines, end of DATA markers, jumps to labels and entry-time syntax checking, among a host of goodies.

Borge Christensen has done much to publicise the Comal language through his writing, showing that as an initial or a second language it's a useful programming medium. A number of countries are looking at Comal as a contender for their secondary school programming language. page 77 ▶



Prolog

The version of Prolog most often found on a microcomputer is Micro-Prolog, and we'll briefly examine it.

The Prolog language is based on *Pro*gramming in *log*ic, and all micro versions are based on an initial specification first implemented in 1973 in Marseilles. It's important to realise that Micro-Prolog is quite a leap away from conventional languages. Certainly it would be as much of a feat to drive a buggy with Micro-Prolog as it would be to create and interrogate a set of sentences in Basic.

Since the first machine language, programming has been carried out using a command language, eg:

```
100 CLS
110 PRINT "I am commanding the
    computer"
120 REPEAT
```

Each of these is a command. When a user is faced with a program, the most frequent comment is 'What does it do?' rather than 'How does it do what it does' and so the relationship between user and the program is different to that between the programmer and the program. Until Prolog appeared on the scene the programmer had to describe *how* a result was to be attained, rather than what was to be computed.

Take the situation where we want to find the lesser of two numbers. In Basic we might write:

```
100 INPUT x, y
110 IF x<y PRINT x
120 IF y<x PRINT y
130 IF x=y PRINT y
```

What we have done is to describe the action of the computer on each line of coding. Perhaps it would have been closer to the logical thinking process to describe the relationship between program input and program output. We might think to ourselves: 'We need to print out the lesser of two numbers entered.' In Prolog this type of descriptive specification could be used as the basis for a program. Unfortunately the English language is too ambiguous to be interpreted exactly, and so a standard form of logic called 'predicate' logic is used to create rules and relationships and to ask queries.

A Micro-Prolog program is basically a set of definitions about the relationship of one item to another, eg:

```
Nick writes-for Acorn-User
George writes-for Acorn-User
Joe writes-for Acorn-User
Paul writes-for Acorn-User
Paul writes-for Mag-X
```

defines some of the relationships between imaginary writers and magazines. We can examine these by asking questions like:

```
which (x : x writes-for Acorn-User)
```

which gives:

```
Nick
George
Joe
Paul
```

and

```
which (x : Paul writes-for x)
```

which gives:

```
Acorn-User
Mag-X
```

Prolog is simultaneously a programming environment; a database environment; and a relational, mathematical and logical environment in which the user defines rules and requests information. Regarded as a fifth generation language, Prolog should be interesting to those for whom the 'what happens' is more important than the 'how it happens'.



BCPL

Another language which can be traced back to the late 1960s is BCPL (*B*asic *C*ombined *P*rogramming *L*anguage). Its generator was a project by Cambridge and London universities which aimed to produce a 'combined programming language' or CPL. CPL was designed to be more powerful than earlier mainframe languages such as Algol, and to have a consistent block-based structure. The size and complexity of the project contributed to its eventual disolution, which left the concepts and some techniques and ideas, but no real CPL implementation.

Part of the project was resurrected in a simplified form and the BCPL language was produced almost exactly in its present form.

BCPL is a compiler which has the benefits of being small, powerful, efficient, fast and capable of developing languages. This means that it can be used to develop further language programs, and in fact the Acornsoft BCPL compiler is reputed to have been written in BCPL, as was the Acornsoft Logo language.

In its short lifetime BCPL has fathered a further language called C and this is a very powerful tool for use particularly with 16 and 32 bit micros. In fact the Unix operating system was written in C.

BCPL is similar in structure to Pascal, but unlike Pascal or Comal, it doesn't use real or integer numbers or strings of characters – it has only the BCPL 'word'. This may be regarded as a 16 bit integer on the BBC micro. Various operators can act on a BCPL word, and there is no reason why words cannot be regarded as text or numbers and handled to suit the programmer. It should be possible to add 'AA' to 'BB' and get a numeric result, if the programmer requires. BCPL has two particular points which users need to be wary of. First, it compiles to an intermediate condensed code, and so needs a run-time segment to interpret the condensed code. Second, BCPL will only handle capital letters.

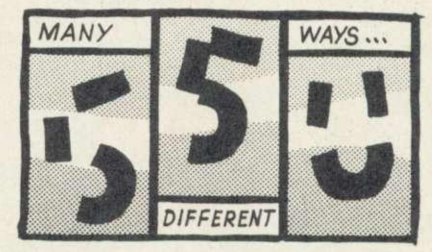
A typical improvement on BBC Basic involves the structure based around the IF . . . THEN . . . ELSE statement. In Basic we might write:

```
1000 IF answer > lowest THEN IF
     answer < highest PRINT "In
     range" ELSE PRINT "Over
     range"
```

where entering an answer less than the lowest will cause an 'Over range' printout. In BCPL we can specify more precisely:

```
IF answer > lowest
THEN
   TEST answer < highest
   THEN
   WRITES ("In range")
ELSE
   WRITES ("Over range")
```

The speed and compilability of BCPL make it important for users wanting to write their own languages and to maintain clarity and structure in the code which they adopt.



Lisp

In the early 1960s John McCarthy and a group of colleagues at the Massachusetts Institute of Technology (MIT)

developed Lisp for use in *LISt Processing*. Lisp was followed by Fortran and Algol but in many ways has been more at home in the micro-age than either of them.

Lisp has become the leading language for artificial intelligence work, and has survived the transfer from mainframe to micro remarkably well. It enables users to consider all programming activities as functions, which are then processed to reach the result.

Consider some ways in which we can look at items of Basic:

```
100 Z=200
110 PRINT "GAME-ON!"
```

In Lisp these items are all regarded as functions:

```
(SETQ Z 200)
(PRINTC 'GAME-ON)
```

and more complicated lines of Basic appear as nested brackets, eg:

```
A=3*(4+5)
```

can be replaced by:

```
(SETQ A (TIMES 3 (PLUS 4 5)))
```

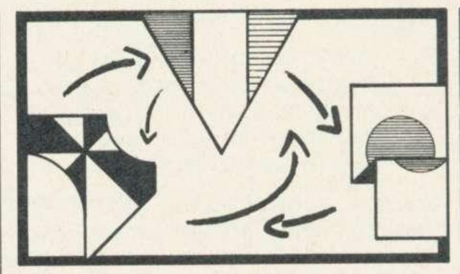
In Lisp these functions can be as deeply nested as the user needs. Logo users should be able to see some similarities with Lisp, particularly where lists are concerned, because Lisp has very powerful list processing facilities. Lists of words or numbers can be manipulated, created and used in many different ways. It's also possible to define functions using others which the system already knows. The language supports recursion so that a function can be defined to call itself.

One suggestion from Lisp devotees is that functional programming will follow structured programming, with its consequent loss of variables. The search to replicate human intelligence in a machine leads us to the possibility that the roots of artificial intelligence could lie in a functional language such as Lisp. A typical example might be the manipulation of English words in user-input sentences which the machine makes sense of. Certainly, natural language processing would require some form of learning capability on the part of the computer, as well as the ability to make sense of ambiguities, based on context.

Pascal

Pascal was proposed in 1968 and was named in honour of the French mathematician Blaise Pascal and as such its name is only an indication of the logical nature of the language. Pascal was derived from Algol 60 and has similarities in its structure.

Pascal is becoming more popular as



colleges and higher education increasingly reject Basic because of its poor structure. One good reason for learning Pascal is that it is an international standard, providing transportability of modules between programs and machines.

Pascal is not too difficult to learn providing a reasonable implementation is available – and Acornsoft have provided this with their ISO-Pascal. Despite it not compiling to stand-alone code, it's a fast and powerful language.

A Pascal program nominally consists of three parts: the program header; the declaration section; and the program body, with a defined end.

The program normally consists of a number of statements which are separated by semi-colons and terminated by a full-stop. The statements can be multi-line statements, or spread over just one line. No line numbers exist within the language.

The program header simply names the program and states what type of input and output channels will be used, eg, keyboard and screen.

The declaration part of the program introduces the variables to be used. Not only should we say what their names are, but also what will be found within the variables.

For example:

```
CONST
   week=7
VAR
   day, month, year : INTEGER ;
   calendar : REAL ;
```

declares that 'week' is a constant and is set to seven, while the variables day, month and year are declared as integers, and calendar is regarded as a real (or decimal) number. Unfortunately strings are not easily defined and have to be built up from individual CHARs of the type associated with single character strings.

The main body of a Pascal program is based on structure blocks which include a wide range of loops and conditionals, as well as procedures. The aim of the language is to produce a direct and precise solution to a particular problem, and this is best done by forcing the programmer to approach the keyboard with the logical framework of the program already devised. To this end Pascal includes an editor which allows source code to be manipulated. The end result after compiling is a form of P code which will run quickly in an interpretive fashion.

Pascal will appeal to programmers who need to transport programs between machines, for apart from extensions for sound and graphics, most implementations of Pascal are completely transportable. In addition, there is every chance that as languages become cheaper, the major educational establishments, particularly in higher education, will move completely to Pascal as their introductory language.

Authoring languages

We could not complete this round-up of languages for the BBC micro without mentioning authoring systems or languages. An authoring language aims to solve a particular subset of problems (often in instruction and training) by providing a very high level language system which a user with little formal programming expertise can configure to a particular application. The authoring language Microtext was reviewed in the October 1984 issue of *AU*.

A regular task performed by an authoring language is the interpretation of a student's replies. In Basic this would be tedious and often difficult to program. However, in an authoring language, such a facility would be built-in.

Most authoring languages operate in a 'group of three' technique. Information is presented to a student, an answer is requested, and as a result of that answer the program selects further extension, remedial or consolidatory information. The information may be in pictorial form, produced with the aid of advanced tools such as picture editors or, occasionally, specially designed keyboards.

The other facilities available are simple debugging to check that the program will function correctly and editing to alter program flow after testing. Some authoring systems may include built-in 'help' facilities to support the student who lacks confidence.

There is no doubt that authoring languages have a useful application in training and instruction, but whether that extends to all learning requires careful consideration.

Conclusion

Over the next few months we'll be presenting much more in-depth coverage of the languages summarised here. This will give readers a chance to focus more clearly on the problem we discussed at the start of this text – which is your second language and, more importantly, which should be your first?

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EVER INCREASING CIRCLES

Mike Williams' fast-acting programs will make your head spin — and not a trigonometric function in sight

READERS have expressed an interest in the machine coding of trigonometric functions (Letters, May 1984). In drawing circles, for example, the obvious method involves the use of sines or cosines and these calculations are undoubtedly tricky in machine code. In this article I describe a machine code program that draws circles in any graphics mode. It's not all that speedy (although certainly quicker than Basic) and for speed freaks there is a really fast version of the program which works only in mode 1 and uses direct screen addressing.

Now, how can we avoid trigonometry? Listing 1 gives a Basic program which draws well-formed circles, but look carefully at it. Not a trigonometric function in sight, and perhaps more importantly, the only arithmetic involved is addition, subtraction and doubling, and these operations are easy to do in machine code. So translating the Basic program into machine code is not very difficult.

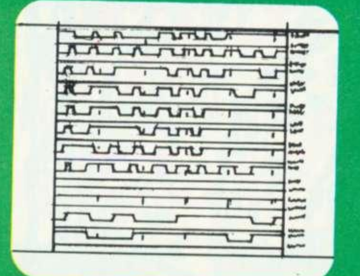
Before showing you how it can be done, a few words about the circle-drawing method. Mathematicians tell me it involves what is known as a potential function. I don't pretend to a full understanding of how that works, but it goes something like this.

Suppose we start plotting a circle (figure 1) at the three o'clock position and move clockwise. The co-ordinates

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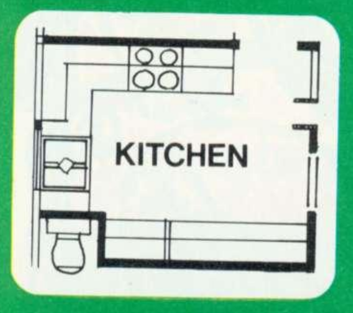


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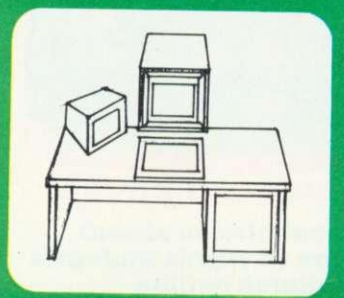
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of the first point are (R,0), taking the centre of the circle as (0,0). The next point must have a Y co-ordinate one less (−1), but whether the X should be one less depends upon the radius of the circle and the screen resolution. Thus the co-ordinates of the next point are either (R, −1) or (R−1, −1). The potential function (the 'T' of the program) decides whether or not X should decrease (line 420). Because of the symmetry of the circle we only need to work out one eighth of it and lines 320-390 plot the eight points.

Listing 2 shows my first attempt at converting the Basic program into machine code. The most obvious way to translate Basic plot statements is to use the VDU commands via OSWRCH, but there is a speed penalty to be paid for such simplicity. If you are a beginner in machine code you might find it instructive to compare the Basic program with the machine code version. The code assembles at &1200 but you can choose any location which gives you about 500 bytes free.

Once assembled, a circle can be produced by the command:

CALLcircle xcenter, ycenter, radius

When calling the circle routine we need to pass parameters, namely the centre of the circle and its radius. I used the method lucidly described by Tony Shaw and John Ferguson (in *Acorn User*, April 1983) showing how to machine code a square drawing command. The code from lines 330 to 470 picks up the values from the parameter block and stores them for later.

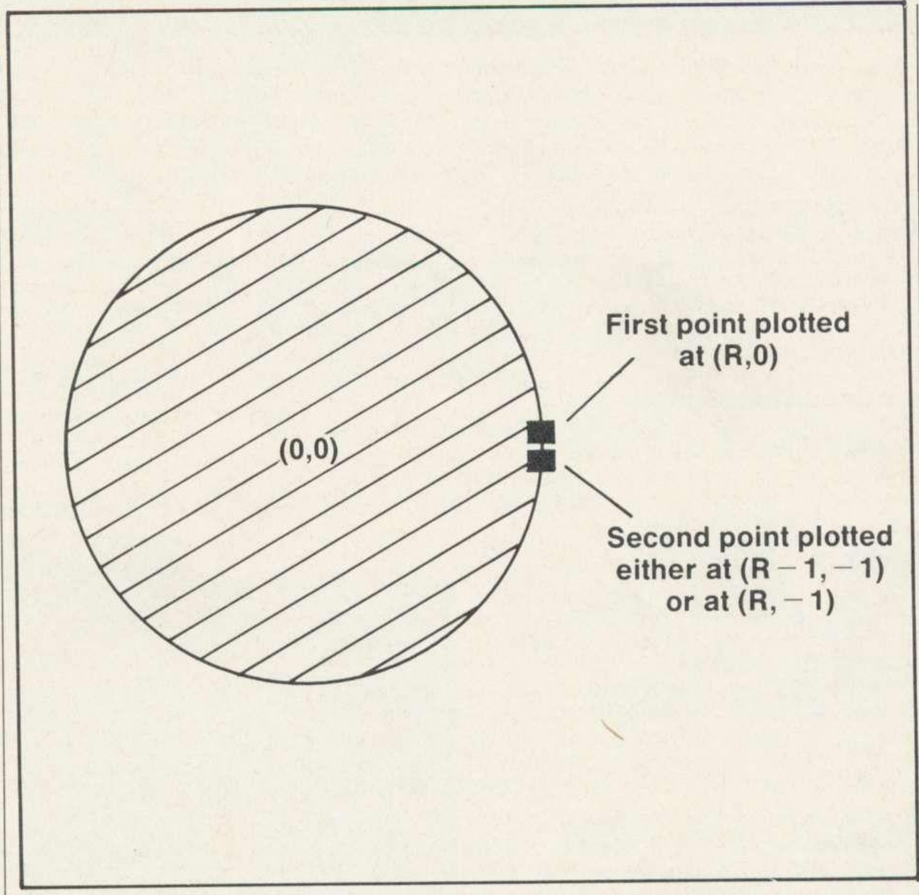


Figure 1. How the potential function works in this method of plotting a circle

Basic	Machine code
230–240	490–510
250	520
260	2270 inserts 19,69 into VDU table
290	590–630
300	640–670
310	680–750
320	770–910
330	930–1000
340	1020–1090
350	1110–1180
360	1190–1330
370	1340–1410
380	1430–1500
390	1510–1580
400	1610
410	1630
420	1640–1730
430	1750–1780
1800	440

Table 1. How the Basic program lines correspond to those of machine code

The rest of the source code follows the Basic program very closely, and table 1 shows the corresponding lines. There are three additional subroutines in the machine code version. One is used when fetching the parameters from the block at &600. Subroutine 'abs' is used as the equivalent of the Basic ABS(variable) syntax. The actual plotting is done by the equivalent of PLOT 69 commands in the subroutine 'plot' at line 1910. It's easily modified to plot dotted circles or whatever by changing line 2270.

If you successfully enter the program and run it, you'll be rewarded by the sight of coloured circles appearing somewhat faster than in the original Basic program. The routine works in any graphics mode, and because it's working through OSWRCH it won't overwrite anything it shouldn't. But it was not fast enough for me! To have really fast plotting routines some 'naughty but nice' direct screen addressing would have to be done.

A third program, not listed on the yellow pages but to be found on the monthly listings cassette and in our barcode booklet, describes a really fast machine code circle-plotting routine which should satisfy the high-speed freaks among you. It is again based on the same circle drawing algorithm, the difference being in the actual plotting of the points. The 'plot' routine has to convert the co-ordinates into screen addresses. To do this I used a very fast and compact routine written by Jeremy San, and I'm grateful for his permission to use it.

The other factor leading to a greater complexity in the code is the need to check that 'poking' does not take place off the screen and also to avoid wrap-around of circles near the edge. My coding was the result of trial and error, and you may well be able to improve it.

There is a price to pay – now we have speed we're restricted to mode 1. In other modes the address calculations and pixel table would need modification, and because of their geometry we would only get ellipses, but if you like mode 1, very fast circles can be yours.

Finally, if you enjoy experimentation, try changing some of the steps in the potential function calculations. For example, in lines 670 or 1750: 670 LDA #0 gives diamonds instead of circles, 670 LDA #128 gives squares, 1750 DEC Xinc: DEC Xinc gives another shape.

You might like to modify the program so that it can be asked to produce circles, squares or whatever at will.

Have fun!

Mike Williams' two circle programs are listed on yellow pages 100-101

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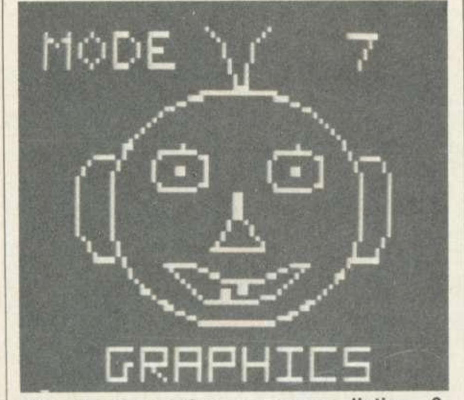
MODE 7 is great for saving memory but it does not have graphics that are easy to manipulate. The following program allows you to have some simple graphic commands, similar to those available in Basic, and works with any operating system on either model A or B BBC micros but is not compatible with the Electron. The program uses the teletext graphics of mode 7 which give a graphics definition of 70 by 70 (how these operate is explained in the *User Guide* on pages 154-158). Colour can also be used; there are seven background and seven foreground colours available, and these can be changed in the middle or at the end of a plotting routine without the loss of the graphics on the screen.

There are three graphics procedures. PROCMOVE (x,y) moves the start position of the next line to position x,y on the screen. PROCPLOT (x,y) plots a single point at position x,y without moving the cursor to this point. PROCDRAW (x,y) draws a line from the current cursor position at x,y to the point x,y as specified in the PROCDRAW statement.

Listing 2 has a demonstration procedure at the beginning to show how all these may be used. You will of course need to enter and save listing 1 first to run this. First the computer is put into mode 7, then PROCINIT is called. This loads in the machine code part of the program and also sets up some stores for access by the machine code routine, and must be called before any of the other routines are used. A foreground and background colour are then set before starting to plot, and one command is used to set both colours:

PROCGR (''Foreground colour'', Background colour'')

The demonstration routine writes some text on the screen and then draws a



The demonstration program, listing 2, draws a face

face, using the three commands above. It could be used as a teletext title page before loading in the main part of the program.

The letters are produced by moving the cursor to the position on the screen where you want to start them, then drawn using PROCDRAW (x,y), x and y being read from data statements by the PROCD routine to save memory.

The face and eyes are circles. X can be calculated using SIN values, COS values give Y and these produce a circle when plotted using PROCPLOT (x,y). The ears, nose and hair are drawn by moving the cursor to their position on the face, then using PROCDRAW (x,y) as for the letters. To plot the teeth and pupils of the eyes use PROCPLOT (x,y), reading x and y from data statements.

The foreground and background colours can be changed during drawing using PROCGR as before. This allows a change of colour mid-way through a graphics routine, while retaining the picture on the screen. If the foreground and background are set as the same colour (eg, 'BLUE', 'BLUE') then the picture will not show up. A change of foreground or background will show what has been drawn.

The machine code routine is written in assembly language and can be put in many places in memory. I find the most convenient one to use is just below the Basic program, ie before PAGE. If you want to change its position simply alter lines 1090 and 1150 in program 2 thus:

```
1090 *LO. ''PLOT'' (position in hex)
1150 Pixel_plot= &(position in hex)
```

To assemble the machine code, copy out listing 1, leaving out the REM statements if you wish – they are there to help you understand how the program works. At lines 190 and 3260 use the relevant part for your computer, ie if you own a model B use the first part. On running the program, the code will be assembled high up in memory, but when you recall it in your own programs it can be put anywhere, as explained above.

To use the program merge listing 2 with your Basic program and then call the relevant procedures when necessary.

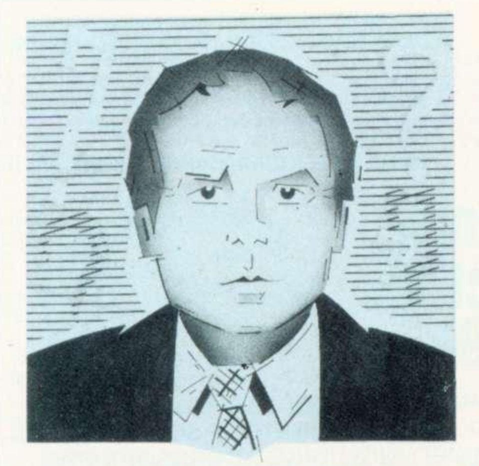
Checking the program

To ensure that you enter the assembler correctly, enter listing 1 but omit the last line for the moment. Run the program, to assemble the machine code then add the following five lines:

```
1 Z%=0
2 FOR N%=&1700 TO &189D
3 Z%=Z%+?N%:NEXT
4 PRINT"CHECKSUM IS :";Z%
5 END
```

Now re-run the program to calculate the checksum. The value returned should be 48185; if it's different recheck the listing. Otherwise delete lines 1 to 5 inclusive, enter the final line and run to save the machine code.

You'll find the listings for Nigel Beasley's mode 7 graphics program and demonstration on yellow pages 102-104



Set yourself on the road to a copy of Wordwise Plus by plotting the shortest route for the lorry in Simon Dally's latest competition

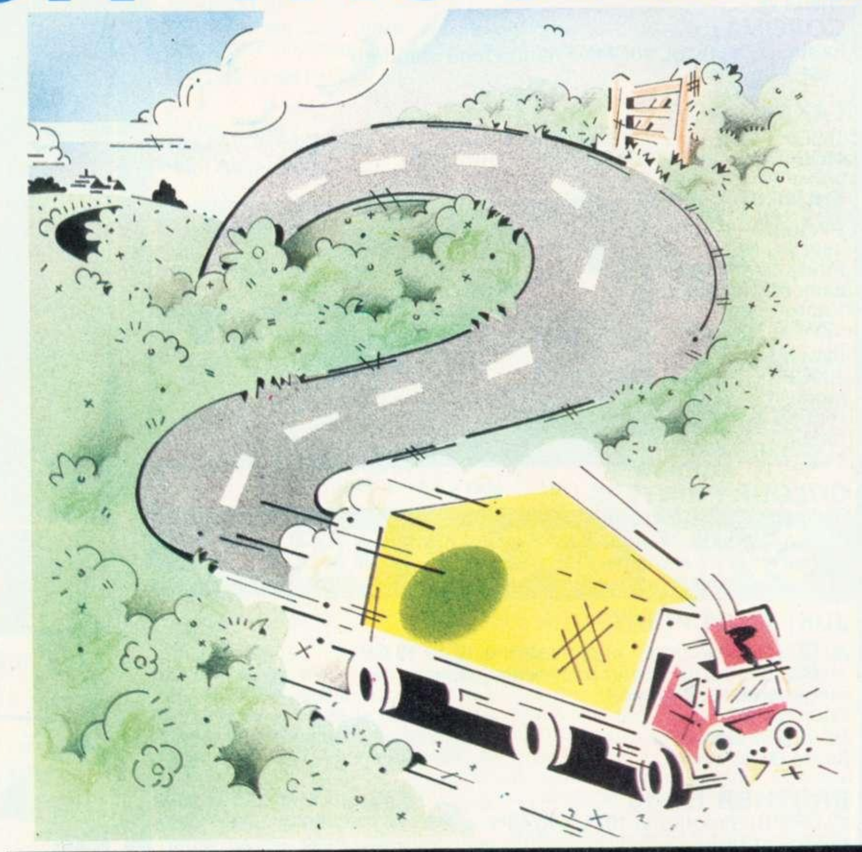
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NOVEMBER's competition attracted about 300 entries, nearly all correct. The arithmetic, of course, was all hexadecimal, with the solution A=2, B=8, C=E, D=5, E=7, I=C, K=D, M=4, N=A, O=1, P=9, R=B, S=6, T=F, U=3, Y=0. Thus the result of the addition sum – 'COMPUTER' – was E1493F7B. The five lucky winners of a computer trolley from Paul Gallini Enterprises were K Scuse of Chelmsford, Sandra Evans of Slough, Iain Gallagher of Lytham St Annes, Bob Tinley of Coventry and Nigel Brumpton of Newark.

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Bristol	84	206													
Cardiff	105	227	43												
Coventry	18	144	91	118											
Edinburgh	291	189	371	392	319										
Ipswich	163	268	198	230	141	393									
Leeds	112	84	194	215	116	207	198								
Liverpool	99	57	179	200	117	222	254	70							
London	121	242	125	157	99	390	73	194	215						
Manchester	86	50	166	187	104	215	226	42	36	202					
Newcastle	199	136	283	304	205	108	279	93	180	283	152				
Plymouth	197	319	120	156	204	484	316	307	292	243	279	396			
Portsmouth	145	273	97	138	132	443	161	240	246	77	233	329	170		
Southampton	130	258	76	117	117	428	158	225	231	84	218	314	148	20	
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7001 High Res Green Screen with sond input £65 + VAT **£75**

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GM1211 18 MHZ High Res Monochrome Monitor with tilt and swivel stand available in green or amber etched antiglare screen (please specify colour £86 + VAT **£99**

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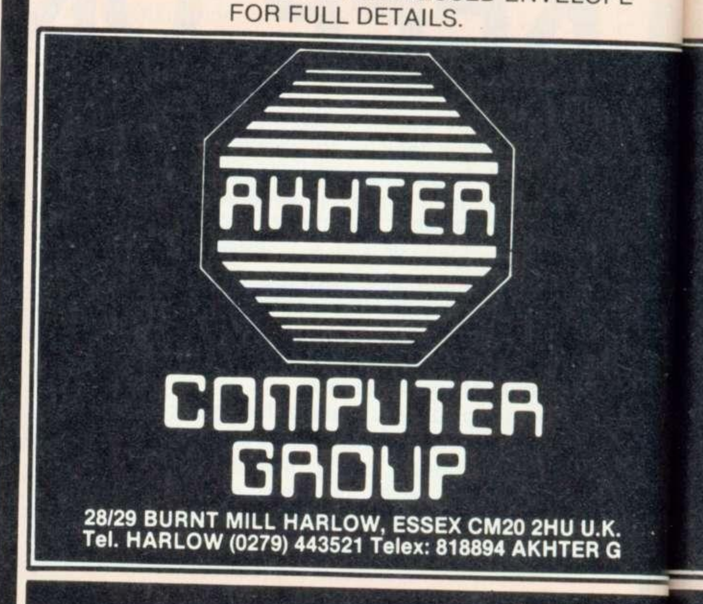
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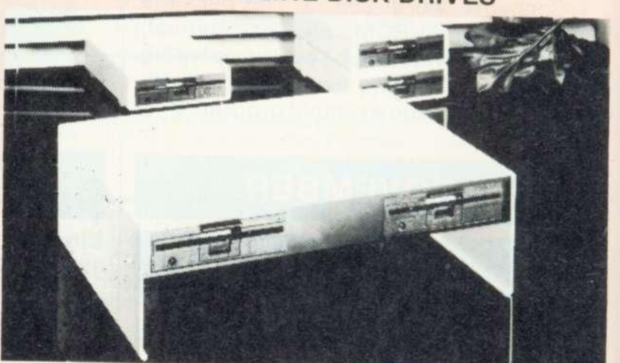
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DISC

100% BBC COMPATIBLE MITSUBISHI AND TEAC SLIMLINE DISK DRIVES



These drives are supplied ready cased with all the necessary cables formatting program and User Guide
There are some very useful utilities included on formating disc e.g.

* DISASSEMBLER: This is 6502 machine code disassembler
* DUP: To copy and rename a file on disc
* FORMAT: Formating progam for 40 & 80 tracks
* FREE: This utility provides a disk usage analysis
* MDUMP: Enables you to display and modify any part of BBC memory
* MERGE: Merge a number of text files into one file
* RELOCATE: Downloads a basic program to &E00
* SDUMP: Screen dump for EPSON In all graphic modes
* VERIFY: Verifies every sector on a disk
* MENU: A flexible menu program

PRODUCTS

BBC Microcomputer Model B	£348 + VAT	**£399**
BBC Mod B - disk interface	£409 + VAT	**£469**
BBC Mod B - Econet interface	£389 + VAT	**£447**
BBC Mod B - disk and Econet interfaces	£450 + VAT	**£517**
BBC Compatible 100K disk drive	£112 + VAT	**£129**
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Acorn Z80	£347 + VAT	**£399**
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Acorn Bit stick	£327 + VAT	**£375**
Acorn IEE Interface	£282 + VAT	**£325**
Acorn Electron plus 1 interface	£52 + VAT	**£60**
BBC Prestel Adaptor	£115 + VAT	**£132**
BBC Telext receiver (Aug)	£196 + VAT	**£225**
BBC cassette recorder and lead	£30 + VAT	**£35**
Disk interface kit (free fitting)	£103 + VAT	**£118**
Mod A to Mod B upgrade kit	£70 + VAT	**£80**
Fitting charge for A to B upgrade kit	£20 + VAT	**£23**
16K memory upgrade kit	£30 + VAT	**£34**
Games paddles	£17 + VAT	**£19**
User Guide	£15	
Advanced User Guide	£12.95	
Econet Guide	£ 7.50	
Econet interface (free fitting)	£60 + VAT	**£69**
Speech interface (free fitting)	£47 + VAT	**£54**
BBC disk manual - formating disk	£30 + VAT	**£34**
Parallel printer cable	£10 + VAT	**£11**
BBC word processor (view)	£52 + VAT	**£59**

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ORDERING INFORMATION

We accept official orders from UK Government and Education establishments. Carriage is £2.50 + VAT (UK only) for normal delivery. If express delivery is required please add £8.00 + VAT per parcel. We accept telephone orders on Barclay and Access card please ring (0279) 443521 (10 lines). all cheques made payable to "AKHTER INSTRUMENTS".



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OPENING HOURS: MON-FRI 9am-6.30pm. SAT 10am-5pm.
We welcome callers, no parking problems.

DRIVES

Single drive 100K 40 trks single sided	£112 + VAT	**£129**
Dual drive 200K 40 trks single sided	£216 + VAT	**£249**
Single drive 200K 40 trks double sided	£129 + VAT	**£149**
Dual drive 400K 40 trks double sided	£251 + VAT	**£289**
Single drive 400K 80 trks double sided	·£152 + VAT	**£175**
Single drive 400K 40 80 trks switchable DS	£155 + VAT	**£179**
Dual drive 800K 80 trks double sided	£303 + VAT	**£349**
Dual drive 800K 40 80 trks switchable DS	£312 + VAT	**£359**
Dual Drive 800K 40 80 trks + PSU + built in monitor stand	£373 + VAT	**£429**

All above drives are low power slimline (0 3 A typ at + 12v and 0 4 at + 5v per drive) Normally extra power supply is not required. The BBC Computer power supply is designed to drive to low power drive (IT IS NOT DESIGNED TO DRIVE INTERNAL ROM BOARD)

SS DD disketts (10 Box) £18 + VAT **£20**
DS DD disketts (10 Box) £23 + VAT **£26**

BUSINESS SYSTEMS

COMPLETE BUSINESS PACKAGE

This system is based on 16 Bit 8088 Processor 128K RAM, 2X730K Floppy Disc Drives, High Res Monitor, fast (160cps) Dot Matrix Printer, Wordstar Wordprocessor, Calcstar Spreadsheet Program, complete integrated Accounts package consisting of Sales Ledger, Purchase Ledger, Nominal Ledger, Invoicing, Stock Control, Payroll and mailing list.
Complete turnkey system at an unbelievable price.
Delivered Only £1495 + VAT **£1719**
Delivered and Installed plus ½ day training £1595 + VAT **£1834**

APRICOT PC
"Portable Executive Computer" 16 Bit Micro. 256K RAM up to 1.44 megabytes flopy disk storage. 3½" Sony disks. Portable brief case styling. Modem with auto dialler (optional) hard disk optional. Vast software library (compatible with Sirius 1).
Apricot with Double Drive, Monitor and ***Free Printer*** £1790 + VAT **£2059**

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As above but with 10MB Winchester Drive and Single 315K Drive plus Superwriter, Supercalc and ***FREE JUKI 6100 Printer***
£2995 + VAT **£3444**

SANYO PROFESSIONAL COMPUTER

SANYO 550
16 Bit Micro 128K RAM expandable to 256K. Single or Double Disk drive built in full colour graphics (640 x 200 pixels in 8 colours) IBM compatible. Free software. Sanyo MBC 550 128K RAM single drive and free software including Wordstar and Calcstar
£749 + VAT £862

SANYO 550-2
As 550 but with Dual Drive 2 x 160K
£849 + VAT **£976**

SANYO 550-360
As 550 but with 2 x 360K Drives
£999 + VAT **£1149**

SANYO 550-730
As 550 but with 2 x 730K Drives
£1049 + VAT **£1206**

SANYO 555
Sanyo MBC555 128K double drive and free software including Wordstar, Calcstar, Inforstar, Datastar etc.
£999 + VAT £1149

SANYO 555-360
As 555 but with 2 x 360K Drives
£1249 + VAT **£1436**

SANYO 555-730
As 555 but with 2 x 730K Drives
£1299 + VAT **£1494**

SANYO SYSTEMS INCLUDE FREE HIGH RES GREEN MONITOR

WORD PROCESSING

COMPLETE SYSTEMS FROM £650 + VAT

BBC 1: BBC Micro Model B, View (or Wordwise) Wordprocessor, Quendata 20 CPS Daisywheel Printer, High Res Green Monitor, Cassette Recorder plus 10 cassettes and all the necessary cables £650 + VAT = **£747.50**

BBC 2: BBC Micro Model B + Disk Interface, View (or Wordwise) Wordprocessor, 100K Disk Drive, High Res Green Monitor, Quendata 20 CPS Daisywheel Printer, 1 Box of Disks and all the necessary cables
£799 + VAT = **£918.85**

BBC 3: Same as System BBC2 but with 400K Drive
£875 + VAT = **£1006.25**

BBC 4: Same as System BBC 2 but with 400K Drive and JUKI 6100 Daisywheel Printer
£975 + VAT = **£1121.25.**

BBC 5: BBC Model B + Disk Interface, View (or Wordwise) Wordprocessor, 800K Dual Disk Drive (Mitsubishi), High Res Green Monitor, JUKI 6100 Daisywheel Printer, 1 Box (10) of 80 Track DS discs and all necessary cables £1145 + VAT = **£1316.75.**

SAN 1: Sanyo MBC 550 Series 16 Bit Microcomputer, 128K Ram, Dual 160K drives (2 x 160K), High Res Graphics (600 x 200 pixels in 8 colours), JUKI 6100 Daisywheel Printer, High Res Green Monitor, 1 Box of 10 discs, Wordstar Wordprocessor, Calcstar spreadsheet and all the necessary cables £1175 + VAT = **£1351.25**

SAN 2: Same as SAN 1 but with Dual 360K Drives (2 x 360K)
£1345 + VAT = **£1546.75**

SAN 3: Same as SAN 1 but with Dual 720K Drives
£1395 + VAT = **£1604.25**

SAN 4: Sanyo MBC 555 Series 16 Bit Microcomputer, 128K Ram, Dual 160K Drives (2 x 160K), High Res Graphics (600 x 200 pixels in 8 colours) JUKI 6100 Daisywheel Printer, High Res Green Monitor, 1 Box of 10 discs, Wordstar, Wordprocessor, Calcstar spreadsheet, Mailmerge, Spellstar (dictionary), Datastar (database), Reportstar plus all the necessary cables
£1295 + VAT = **£1489.25.**

SAN 5: Same as SAN 4 but with Dual 360K Drives
£1475 + VAT = **£1696.25**

SAN 6: *Same as SAN 4 but with Dual 730K Drives
£1525 + VAT = **£1753.75**

If you require High Res Colour Monitor instead of High Res Green Monitor in Sanyo Systems please add £320 + VAT = £368 to the above prices.
***128K RAM Upgrade for all above Sanyo systems (makes a total of 256K RAM) £150 + VAT = £172.50 including fitting.**

Any improvement on Britain's No. 1 word processing ROM...

WORDWISE was the very first ROM based product to be made available for the BBC computer and over the last couple of years it has become the most popular word processing system for the BBC machine with almost 50,000 chips now sold.

It has consistently received excellent reviews for its ease of use and speed. It takes only minutes for the user to become familiar with a powerful professional word processing system.

WORDWISE PLUS is now available extending the original program in many unique directions. Not only is the program now twice the size but the package includes two completely new manuals—an introductory manual that gently introduces the newcomer to word processing with WORDWISE, and a reference manual listing all the commands.

THE WORDWISE PLUS PACKAGE CONTAINS
1 16K ROM
2 SPIRAL BOUND REFERENCE MANUAL (180 pages)
3 INTRODUCTORY MANUAL (56 pages)
4 KEYSTRIP
5 TYPING TUTOR PROGRAM (On cassette)
6 EXAMPLE TEXT (On cassette)
7 EXAMPLE PROGRAMS enabling mail merging, index generation, etc.

WORDWISE PLUS is completely compatible with all older versions and is able to use existing WORDWISE files without modification.

WORDWISE PLUS FEATURES

Over the last couple of years we have received countless suggestions for ways of extending or adding new facilities to WORDWISE. It soon became obvious that we would not be able to implement every single suggestion. Indeed, each person uses a word processor in a different way—each individual has differing requirements—a feature that one person may think essential another may have no need for.

We have overcome this problem in two ways. Firstly we have included the most commonly requested additions and improvements. A number of new editing features and a few more embedded commands have been added.

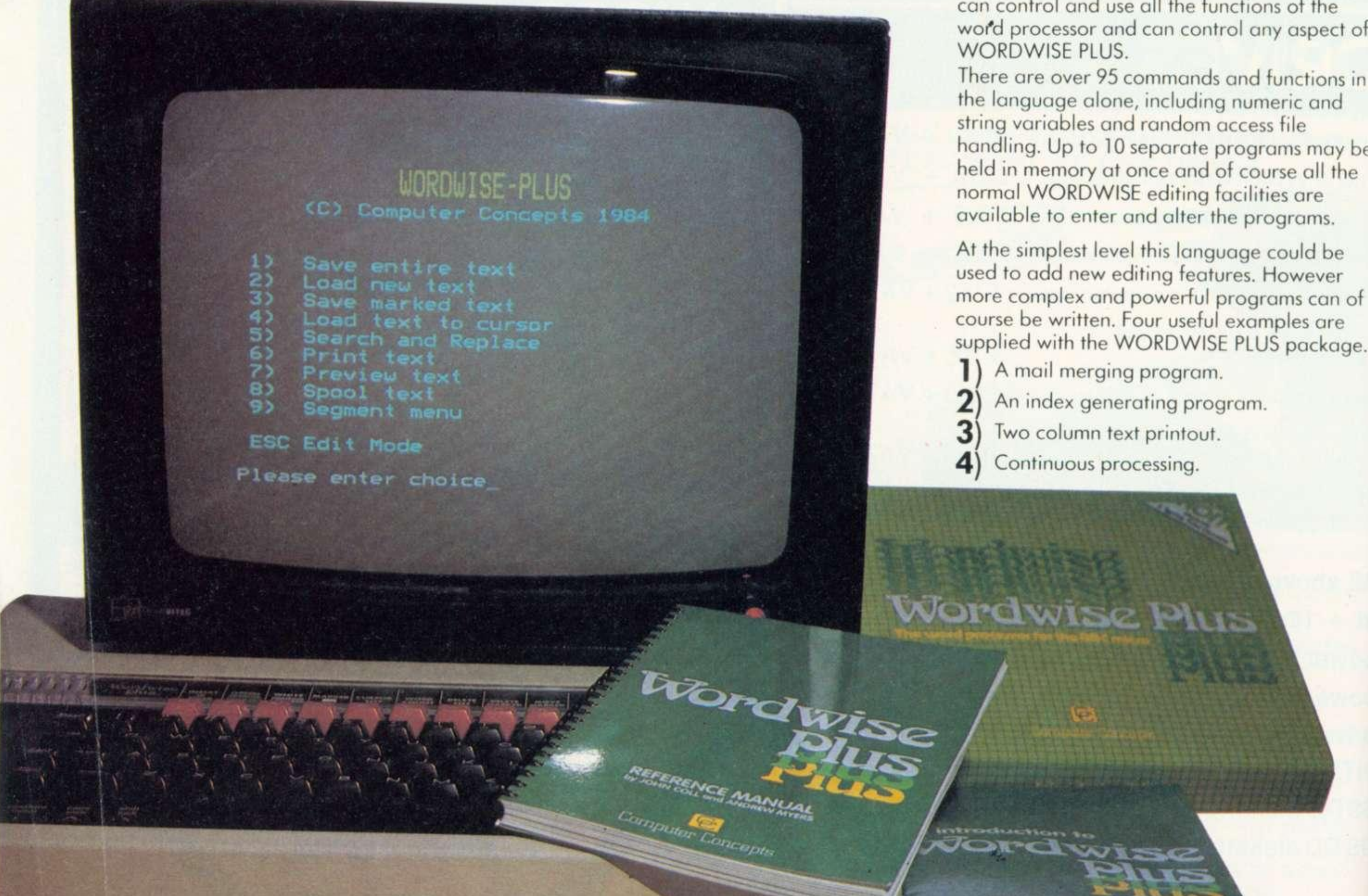
Secondly a unique BASIC-like programming language has been incorporated. This facility enables the capabilities of this word processor to be extended in an infinite number of ways.

The language itself has been designed, like WORDWISE, to be simple to use and understand. Many of the commands look and act like BASIC commands and so will be familiar to many users. However the language can control and use all the functions of the word processor and can control any aspect of WORDWISE PLUS.

There are over 95 commands and functions in the language alone, including numeric and string variables and random access file handling. Up to 10 separate programs may be held in memory at once and of course all the normal WORDWISE editing facilities are available to enter and alter the programs.

At the simplest level this language could be used to add new editing features. However more complex and powerful programs can of course be written. Four useful examples are supplied with the WORDWISE PLUS package.

1) A mail merging program.
2) An index generating program.
3) Two column text printout.
4) Continuous processing.



...Must Be A Plus

Word Processing With Wordwise

All the advantages of a ROM—instantly available. One command and your BBC machine becomes a powerful word processing system.

Fast and very simple to use.

The more complex commands are menu driven, enabling those totally unfamiliar with this software to use these more powerful features straightaway.

The function keys are used to full effect with a keystrip clearly showing each function.

Block copies and moves. It is possible to mark any part of your text, this marked section may be instantly moved or copied to any other part of your text. This cut and paste type of operation is a vital part of all word processing operations and with WORDWISE it is simplicity itself.

Automatic headings, footings and page numbering. When printing a document many pages long it is possible to have WORDWISE number the pages for you and put any heading or footing line on each page.

Unique word counting feature. Ideal for journalists, it constantly displays the current number of words typed. It also allows word counting for specific sections of a document.

Works with all filing systems, such as DISC., CASSETTE., and the new ADFS. Works with any printer that works with the BBC machine (most do) and is able to access the special features of any printer (italic, subscripts, etc.). There is no need to buy additional printer driver programs.

Here are a few of the things that have been said about WORDWISE.

"WORDWISE offers an extremely user friendly program . . . it would make an excellent choice for someone rather apprehensive about word processing."

. . . E & CM

"WORDWISE has won a devoted fan club because of its flexibility and ease of use."

. . . Practical Computing

"On the whole WORDWISE is an excellent wordprocessor . . .WORDWISE is thoroughly recommended."

. . . VIEWFAX 258

"WORDWISE is straightforward, friendly and excellent value."

. . . Practical Computing

". . . it is ideal for the home hobbiest and small businessman."

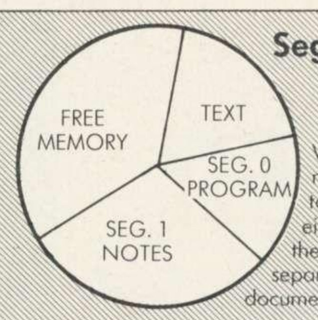
. . . A & B Computing

Word Processing with Wordwise Plus

WORDWISE PLUS still has WORDWISE as its core therefore it is still very user friendly and retains all the features that made WORDWISE the most popular word processor. It now has many new additions making this the most flexible word processor yet.

WORDWISE will continue to be sold alongside WORDWISE PLUS. For those more specialised users who require the added flexibility here are a few of the new features.

Segments



When using WORDWISE PLUS, the BBC's memory is divided between your text and up to 10 'segments'. Each segment may contain either a program or just normal text. It is therefore possible to store and edit up to 11 separate documents in memory, or 1 document and 10 programs, or any mixture.

Often when writing letter or articles it is useful to keep a notepad, outlining what you intend to write. In WORDWISE PLUS one of the segments could be reserved for an electronic notepad. It would be a simple matter to switch your 'notepad' and your main document with just a single key press.

Some of the New Editing, Embedded Commands and Wordwise Extensions

WORDWISE PLUS works with the 6502 2nd processor. This allows more text to be stored in memory and 80 column previewing no matter how full memory is.

New embedded command FI will fully indent text against the right margin.

New commands for underlining and bold printing. The bold and underline effects are shown on screen—and it is a simple matter to configure these features for any printer.

Saving and loading of text is now up to 10 times faster on disc, and now the computer gives the user a warning if a document is going to be overwritten on the disc or in memory.

There is now a working filename—i.e. WORDWISE remembers the name of the current document being worked on.

New command deletes markers automatically.

It is now possible to print or preview a file directly from disc without having to load it first.

New embedded command 'PS' allows strings to be inserted into the text when it is printed.

New embedded command 'PF' will read a document from file when printing and interpret any embedded command in that file.

Improved search and replace facilities now include wild-cards.

Example Programs Supplied With Wordwise Plus

1) A mail merging program that allows names and addresses to be added to a standard letter. This is a relatively easy job with this language.

2) An index generating program. This finds keywords and generates a separate index listing the word and the page numbers where the keywords occurred.

3) Two column printout. This program will print your text in two columns across the page.

4) Continuous processing. This enables the disc user to process and edit extremely large documents spread over several files as if it were one continuous document in memory.

Upgrades

WORDWISE PLUS for only £17+VAT.

Existing users of WORDWISE can upgrade to WORDWISE PLUS for £17+VAT (£19.55). We are only able to offer this service through ourselves at the address below. Please return the old WORDWISE package complete with chip (suitably protected for postage) and the manual with your cheque or P.O. or quote your Access or Barclaycard number. We will then send you the complete new package.

In The Near Future

HI-WORDWISE for 2nd processors that allows even more user memory, supplied on disc for less than £5 to WORDWISE PLUS owner.

A FAST SPELLING CHECKING PROGRAM.

Both WORDWISE and WORDWISE PLUS are available from all good computer dealers. Alternatively you can obtain these directly from Computer Concepts.

WORDWISE PLUS £49+VAT (£56.35)
WORDWISE £39+VAT (£44.85)

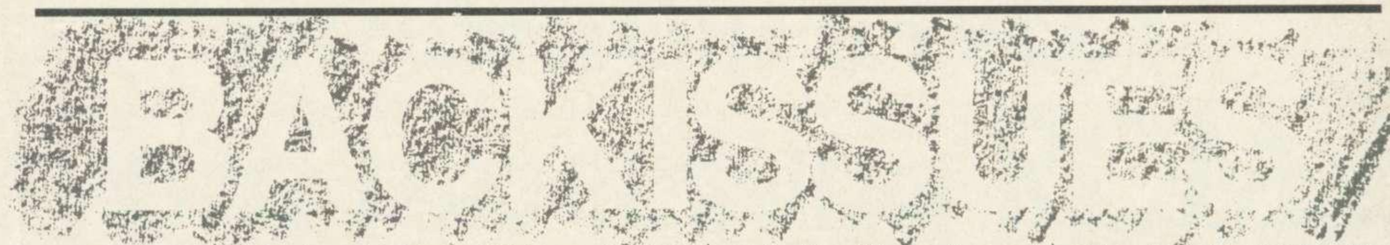










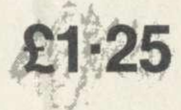


1. July/August 1982 The first issue. Articles on drawing techniques. The BBC Computer Programme. Machine code graphics. Questions & answers. Hints and Tips. Sound. Interfacing scientific instruments. Dumb Terminals for 0.1 machines. Disc drives. Econet in schools.

2. September Ceefax telesoftware. Beeb in business. Mailing list. Simple files. 30-Hour Basic course. Art on a micro. Music. BBC micro as a keyboard. Extra Atom commands. BBC Basic board. ULA design. Teletext graphics. Machine code graphics. Analogue input. Schools training. 0.1 cassette bug patch.

3. October Electron details. BBC TV series – confessions. Two Epson graphics dumps. Seikosha GP100 dump. Worldwide networking for BBC micro. Garbage handling. Voice ROMs. Sound pitch envelope. Moving graphics. ZX printer for Atom. RGB colour separations for Atom. Biofeedback. Book reviews.

4. November Teletext. Second BBC TV series. Machine code series 1. Programming forum. *Trek III*. Speeding up graphics. Bomber game listing. 7-tone Epson graphics dump. Atom graphics manipulation. Dumb terminal for 0.1 machine. Firework graphics. Editing tips.

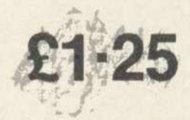


5. December BBC TV in schools. Machine code 2 – registers. Programming forum. Program generators. Carols. Hints & Tips. Logo and Turtle graphics in schools. Introduction to procedures. Software review. Atom word processing. Toolbox review. 16-colour graphics on model A. Sorting. Sound envelope design.

6. January 1983 MEP school launch. *FX commands for sound. Second BBC TV series. Machine code 3 – two pass assembly. Disc drives for the Beeb. Programming forum. Program protection. Micros in schools – new series. Commodore Pet printer used with Beeb. BBC programs written on an Atom. Extra Atom memory.

7. February 1 MHz bus examined (4). 3D Atom graphics (3). Atom BBC Board reviewed (3). Machine code 4 – memory (5). BBC Computer Literacy update (1). Atom error handling (2). Micros in schools 2 – getting organised (6). Hints and Tips (4). Beeb Forum (3). Reviews of *Wordwise* (2) and the Amber printer (1).

8. March Chess on the BBC micro (3). Sound on the Beeb (4). Printers for beginners (4). Atom analogue converter (2). Schools 3 – micros and maths (6). Machine code 5 – indirect addressing (3). DIY lightpen (5). MEP's *Microprimer* review (2). Atom Ross toolkit review (1). Beeb Forum (2). Assembly language and Pascal book reviews (2).



9. April *Hexangle* game listing (4). Bach on the Beeb (4). Hints & Tips on disc drives (4). Machine code 6 – the CALL statement (4). Interfacing the 1 MHz bus (3). Schools 4 – young children and micros (6). Graphics listings (2). Printers for beginners 2 (4). Reviews of BCPL, educational software and Atom software (3).

10. May Review of Basic II. Graphics listings. New *FX calls in OS1.2. Colour mixing on the Beeb. Jazz, blues and folk on the BBC. Schools 5 – language development. DIY Beeb interface box. Atom sound board. A to Z of printing: how to get going. Hints and Tips: PROCs, discs and FNs. Printer, software and book reviews.

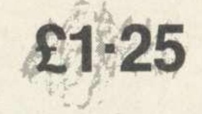
11. June Techniques series – sorting. Hints and Tips: 50p network. Drawing techniques and CAD. Machine code: interrupts. Schools 6 – information technology. Atom Forum. Beeb Forum. Printers – write your own graphics dumps. Comparative review of *View* and *Wordwise*. Three graphics packages reviewed. Test of *Acorn User*'s interface box.



12. July Techniques – hash tables. Hints and Tips: logic made easy. Recursion and graphics. Handling strings. Two ideas for passing variables. Beeb aids the blind. DIY second keyboard. Beeb Forum. Sounds on the Atom. Hardware, firmware, software and book reviews. Atom Forum.

13. August Printer graphics and dumps. Techniques – Tree structures and sorting. All the fun of the fair. 40/80 disc copier. Colour painting. Basic II: random access files. Screen dumps for Olivetti, Centronics and Seikosha. Atom strings. Reviews of Tandy CGP115 printer, five educational packs, A to D converter.





14. September Techniques – ink-blots and mazes. Painting by lightpen. DFS space explored. Beeb Forum. *Mega Monsters* game listing. Machine code graphics dumps. Atom Forum. Atom cassette recorder check. Reviews of Atom RAM boards, Cumana disc manual, *Logo* for schools, Hobbit floppy tape and books.

15. October Women and computing. Techniques – random numbers. Review of Computer Concepts' *Beebcalc*. Fractal graphics. 57 files on 40 & 80 track discs. *Vampire* game listing. Beeb Forum. Assembly code controls tab key. Osfile merging. Atom future. Atom verify routine. Reviews of *Vu-Type*, Procyon Atom book, Epson FX80, Teletext adapter, disc drive, software.



16. November Techniques – impossible problems. Contour graphics. Connecting two Beebs together. XREF: sorts & lists variable, function and procedure names. Assembler utilities in Basic II. OS, VDU, *FX, OSBYTE calls – **pull-out poster**. Disc overlays. Adding extra Atom commands. Reviews of 7 educational packs, Atom ROM, books, games.



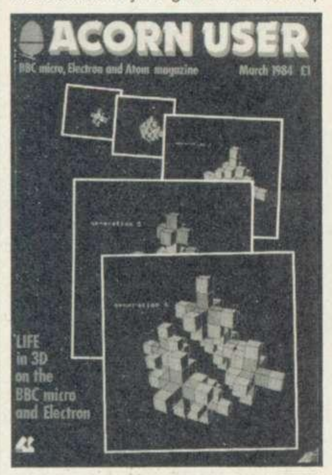
17. December Random graphics. Animated graphics in colour. Techniques – graphs. Hints & Tips. Universal printer dump. 6522 connected to the Electron. Saving machine code. Beeb Forum. Graphics **pull-out poster**. **Index:** July 82–July 83. Forum Extra: EQUS. BBC helps the disabled. Schools – data processing. Transferring data between Beebs, Atoms . . . or Pets. Atom block demolition utility. Atom disassembler program. Reviews of software, books, educational programs from Chalksoft.

18. January 1984: Games special issue Techniques – graphs part 2. Stacks and queues, Basic and languages. Hints & Tips. Voice chip revealed. How to write games. Electron interfacing. Beeb Forum. Life graphics routines. *Defencecom* game listing. *The Train Game* listing. Machine code graphics. Where to put machine code. Schools – handling data. Juki daisywheel printer examined. Atom Forum and adventure. Reviews of utilities, software, *Beeline* wordprocessor, educational packages, two chess programs.

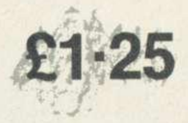


19. February: Adventures special issue Techniques – efficient sorts. PROC for a numeric keypad on the Beeb keyboard. 12 graphics listings. Random access filing on disc. Locking files. MCP40 printer/plotter looked at. Hints & Tips. Beeb Forum. Make discs readable on 40 and 80 track drives. Screen memory organisation. Hints on adventure design. Adventure action. Adventure ideas in computer language. Text compression. Word-crunching. VIA chip on Electron to drive a parallel printer.

Atom Forum. Schools – simulation packages. Reviews: *Disc Doctor*, Leasalink's DFS upgrade, Hitachi's microdrive system, Solidisk's sideway RAM board, software.
20. March Utility: timing routine. Fractals. Teletext and mode 7 dump. ROMs reviewed. Hints & Tips. Beeb Forum. Add sounds to your games. Learn Lisp



1. Cube graphics. Printer driver for View. Basic II from Basic I. Beeb's ADC chip. Atom Forum. Listing formatter for the Atom. Atom 'bytes free' routine. Schools – test of *Factfile*. Keyboard skills. Amcom DFS v Acorn DFS. Reviews: *Beebpen* wordprocessor, Atom expansion system, software, books.
21. April Beeb graphics on TV. 6845 chip explored. Advanced filing systems. Lisp 2. Hints & Tips. Beeb Forum. Choose disc tracks to copy. Function key editing. Teletext dumps. CES scrutinised. Passing variables. Computer Concepts' graphics ROM. Schools – simulations. Calculating Easter dates. Better programming. Atom Forum. Atom ROM routines. Converting BBC to Atom Basic. Three printers compared. Reviews: software, Aries B20 RAM board, *Toolkit*, Monitors.



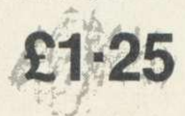
22. May Bitstik graphics system. Hints & Tips. 6502 second processor examined. Lisp 3. Beeb Forum. Disc utility to keep track of available space. Statistics. Pattern graphics. OSWORD explained. 4 colour graphics listings. Second-hand



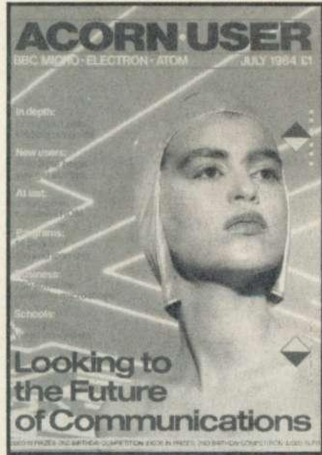
disc drives. Education – do girls get a fair deal? Atom Forum. BBC to Atom Basic 2. Reviews: British Micro's Grafpad, *Edword* wordprocessor, 4 sprite generators, Opus microdrive, Beasty, software.
23. June Acorn Z80 second processor. Forth. Graphics to brighten up your games. Soft Pottery graphics. Go faster and save memory space. Rapid search



and load routine for tapes. How the Beeb and Electron work 1. Business: reviews and how to gently enter office computerisation. Education – adult literacy. Dumping Atom programs on the BBC. Atom Forum. Software copyright laws. Hints & Tips. Techniques – B-Trees. Beeb Forum. Reviews of monitors, printers, books, software, adventures, EPROM programmer.

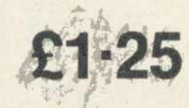


24. July Communications: the future; portable micros; modems & electronic mail. Hints & Tips. First Byte: using your micro. Beeb Forum on Basic. How it works II: slow down the Beeb. Business: Acorn's Z80 software, Starbase ROM. Education: a look at Edfax, how to teach facts. Atom Forum. Converting BBC to Atom Basic. Reviews:



Electron Plus-1, Solidisk's 128k RAM board, three IEEE interfaces, Canon colour and Brother printers, ADE ROM.
25. August Downloading the weather. Teaching tots: keyboard overlays, activity board. First Byte: writing & debugging programs. Hints & Tips. Beeb Forum: 6502 second processor & Tube tips. How it works III: random numbers. Business: Plan software for Z80. Atom Forum, avoiding errors. Reviews: 3 drawing packs, Torch Unicomm, MCP's Interbeeb, software plus for Micronet.

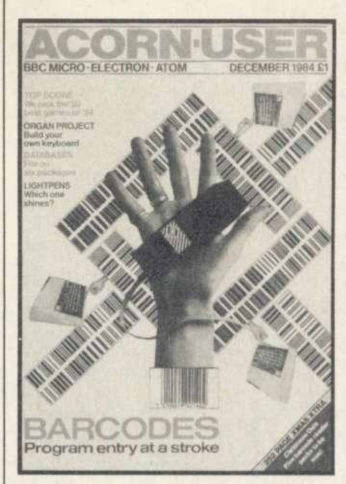
26. September Decoding radio signals, First Byte: getting moving. Hints & Tips. Education: problem solving. Sprite design and animation part I. Beeb Forum: fastest dump. Write your own disc formatter. How it works IV: random number generator. Business: Nucleus software for Z80, accounts. Atom Forum, ? and !. Reviews: Torch Unicorn, Quinkey, Parfitt plotter, Turbo compiler, Multi-aid.



27. October The BBC and space. First Byte: noises on the Elk. Hints & Tips. Sprite design and animation part II. Programming the 8271. Sorting techniques. Diagnosing ills in the Beeb. Beeb Forum: NFS update. Education: report on government scheme, review of Microtext. Atom: wordprocessor. Communications: bulletin boards. Reviews: Basic utility ROMs, sideways ROM sockets, Bearsoft's Editor, Watford's Buffer & Backup, Ampersand's Colour module.
28. November Acorn's ABC range. First Byte: drawing. Hints & Tips: 3D-effect printing. Sprite design and animation part III. Floating point variables. ROM juggler. *Micro Live*. Education: news, Edword in the classroom, school quiz. Atom forum: hardware, the Auto command. Reviews: Six turtles and buggies. Toad's extension socket, Watford's Speech Synthesiser and



Beebfont ROM, BBtype, Romex 13 ROM board, 3 language coaching packs, two graphics tablets.
29. December Guide to bar codes. First Byte: text & graphics windows. Hints & Tips: control codes for Epsons. The Domesday project. Low-cost keyboard for the Beeb. Dumping games' screens. Speed up your micro. DIY database. Education: news, science quiz, review



of the Dudley suite of software. Atom: Forum, build a ROM pager, competition. Reviews: 6 databases compared, part I of lightpens, Acornsoft's Logo and Pascal, best games of 1984.
30. January 1985 Games special: Quadline, Picture Puzzle, musical tunes. Colourfill graphics. Hints & Tips. Operation



Raleigh report. Setting up your own teletext database. Second processors examined. Education: news, activity board revisited. Reviews: 6 wordprocessors compared, three astronomy packs, software for lightpens.

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E·I·G·H·T of the G·R·E·A·T·E·S·T

During 1984 thousands of readers have played the Acorn User software games **Swordmaster** and **Trek**. Now we have expanded the range with six more tremendous games on cassette and disc. Every one is an absolute winner and, of course, great value. Give yourself a present this year, with the best wishes of Acorn User.

Produced, developed and tested by Micrograf

VAMPIRE CASTLE

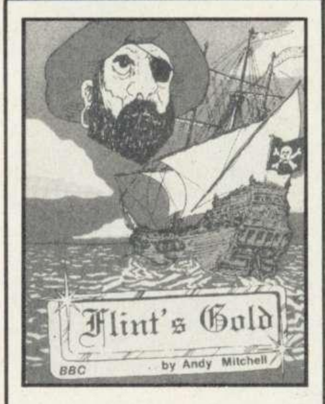
Make sure you play this adventure with the lights on. It plunges you into spine-chilling reality, where you can almost smell the dank odours and feel the terror around every corner. Eyes peer at you through the gloom and all manner of creature awaits your slightest error. Try to find and destroy Dracula, but *remember there are fates worse than death.*

The game, written by Andy Mitchell, includes suitably eerie music and surprise graphics, and we accept no responsibility for heart attacks suffered as a result.

'A gem of an adventure' – **PCN**

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FLINT'S GOLD

If you suffer from sea sickness, scurvy or beri-beri this game will either kill or cure. It's a swashbuckling adventure that may be the experience of a lifetime – if you can survive long enough. In your search for the legendary Flint's Gold you will sail the Spanish Main to a land of blood-thirsty pirates, and you may never return.

The sound of crashing surf, the cry of seagulls, and the accompanying sea shanty are so realistic that you can almost taste the salty air.

'It's a far better story than the Hobbit' – **Micro User**

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TREK

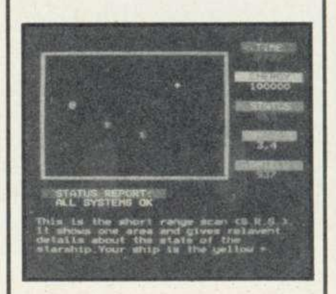
TREK was the first game to take advantage of voice synthesis on the BBC micro – and uses joystick or keyboard.

Trek puts you in charge of a Starship with the task of wiping out an alien fleet. It's an excellent adaptation of the classic game with 7 screen displays, 3 on-board computers and 2 weapon systems.

Versions have been written for BBC micro and Electron to use both machines to their full. The BBC tape uses voice synthesis (if the chips are fitted).

The game has been extensively developed from Tim Heaton's famous Trek III. It barely fits into 32K.

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SWORD MASTER

SWORD MASTER is one of the few two-player games around, and is designed for joystick or keyboard.

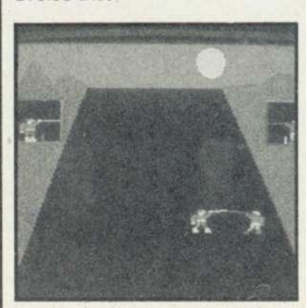
Sword Master by Ken Worrall is based on the fencing rules written in 1190 by Herman von Salza for the Deutscritter Order of Teutonic Knights. It features full-colour machine code animation of a sword duel between two knights.

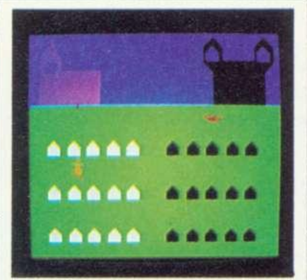
'. . . A quality game with high class graphics . . . one of the most enjoyable games I have played' – **Home Computing Weekly**, June

'Swordmaster is an immensely entertaining game with excellent graphics and animation' – **Personal Computer Games**, June

'Swordmaster is a unique game . . . one of the few two-player games that makes more than a token gesture towards truly interrelated action – **PCN**, June

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COMPENDIUM

A tremendous-value compendium of the three most popular *Acorn User* games.

HEXANGLE demands the utmost concentration. You and the micro take turns in drawing lines between the six points of a hexangle, avoiding at all costs completing a triangle while at the same time forcing the computer to do so.

In MEGA MONSTERS you are confronted by waves of aliens. While avoiding these and many other obstacles you have to rescue the stranded mutants. It gets more difficult with each phase until finally you face the Monster himself.

VAMPIRE is a two-player action game in which good battles with evil. Each player has an equal number of souls in his care, represented by tombstones or crosses. During each period of day or night one player has the chance to recover or capture souls from the other. The winner is the one to recover all the souls.

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CORPUSCLE

In this superb machine code action game by Ken Worrall you assume control of the body's defences, journeying into the three-dimensional labyrinth of the human arterial system. Invading colonies of bacteria advance relentlessly and you must destroy as many as you can. If you fail to keep the bacteria count low they attack individual organs. You must then frantically follow the network of arteries to reach the site of infection. Too many critical areas and you die.

You don't need to know a great deal about the body to begin with – a map is provided. But we guarantee you'll know a lot more when you've finished. It's a unique adventure, truly educational and great fun.

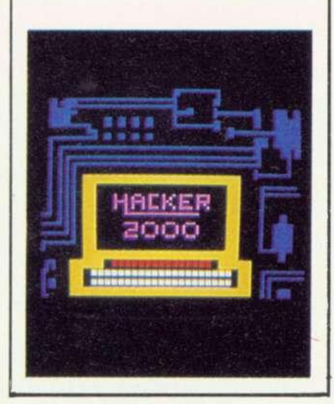
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HACKER 2000

In the year 2000 only two classes survive, Programmers and Proles. As a Prole, your only escape from a life of drudgery is to 'hack' your way into the massive Multivax complex in order to change your Brain Scan Report and obtain money to bribe the Thought Police.

You may gain vital information with the assistance of the Duty Android in a tour of the complex. If you manage this, you're on your own. From here on you start to appreciate the originality of the game in its representation of a real-time system. You'll need all your powers of logic and some lateral thinking to use the information you glean to 'hack' through the Multivax systems. Your goal can be reached in an unlimited variety of sequences.

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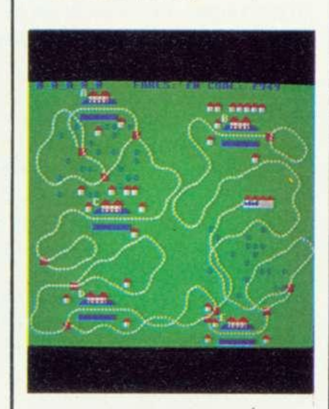


TRAINS

This classic game by Peter Balch requires quick wits and clear thinking. Your aim is to manoeuvre a number of trains around a complex network of track, as you pick up fare-paying passengers and deliver them to their destinations. All the time your valuable stocks of coal are dwindling. If you succeed, you have even more trains to control and more passengers to collect. And as if this were not enough to cope with, you are confronted by the Demon train over which you have no control.

The game has excellent graphics and will keep you on your toes. See how profitably you can run a railway.

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EXPRESS ORDER FORM

EXPRESS ORDER FORM

See 'Hints & Tips', page 41

Listing 1. Version 6 of the simple database

```
   1 REM Listing 1
  10 REM Simple database, version 6
  20 REM Martin Phillips
  30 REM (c) Acorn User March 1985
  40 REM Electron & BBC Micro
  50 :
  60 MODE6
  70 PROCinitialise
  80 PROCmenu
  90 END
 100 :
 110 DEF PROCinitialise
 120 VDU19,0,4,0,0,0
 130 VDU23;8202;0;0;0;
 140 A%=0:F%=0
 150 DIM data$(10,100)
 160 ENDPROC
 170 :
 180 DEF PROCmenu
 190 REPEAT
 200 CLS
 210 PRINTTAB(18,1)"MENU"
 220 PRINTTAB(5,4)"1 Load records"
 230 PRINTTAB(5,6)"2 Enter field names"
 240 PRINTTAB(5,8)"3 Input records"
 250 PRINTTAB(5,10)"4 Save records"
 260 PRINTTAB(5,12)"5 Look at records"
 270 PRINTTAB(5,14)"6 Edit records"
 280 PRINTTAB(5,16)"7 End"
 290 PRINTTAB(5,18)"Enter choice ";
 300 A=GET-48
 310 IF A=1 THEN PROCload
 320 IF A=2 THEN PROCenterfields
 330 IF A=3 THEN PROCinput
 340 IF A=4 THEN PROCsave
 350 IF A=5 THEN PROClook
 360 IF A=6 THEN PROCedit
 370 UNTIL A=7
 380 CLS
 390 ENDPROC
 400 :
 410 DEF PROCinput
 420 IF A%=100 OR F%=0 THEN GOTO 530
 430 REPEAT
 440 A%=A%+1
 450 CLS
 460 PRINTTAB(13,1)"ENTER RECORDS"'
 470 FOR T=1 TO F%
 480 PRINTdata$(T,0);
 490 INPUTLINE TAB(12)data$(T,A%)
 500 NEXT T
 510 INPUT"Enter another record
     (Y/N)? "A$
 520 UNTIL A$="N" OR A$="n" OR A%=100
 530 ENDPROC
 540 :
 550 DEF PROCload
 560 CLS
 570 PRINTTAB(14,1)"LOAD RECORDS"'
 580 IF A%=0 THEN GOTO 610
 590 PRINT"ARE YOU SURE (Y/N)?"
 600 IF GET$<>"Y" THEN GOTO 720
 610 INPUT"Enter filename "file$
 620 A%=-1
 630 X=OPENIN(file$)
 640 INPUT #X,F%,title$
 650 REPEAT
 660 A%=A%+1
 670 FOR T=1 TO F%
 680 INPUT #X,data$(T,A%)
 690 NEXT T
 700 UNTIL EOF#X
 710 CLOSE #X
 720 ENDPROC
 730 :
 740 DEF PROCsave
 750 CLS
 760 PRINTTAB(14,1)"SAVE RECORDS"'
 770 IF A%=0 THEN GOTO 860
 780 INPUT"Enter filename "file$
 790 X=OPENOUT(file$)
 800 PRINT #X,F%,title$
 810 FOR N=0 TO A%
 820 FOR T=1 TO F%
 830 PRINT #X,data$(T,N)
 840 NEXT T,N
 850 CLOSE #X
 860 ENDPROC
 870 :
 880 DEF PROClook
 890 IF F%=0 THEN GOTO 1040
 900 CLS
 910 PRINTTAB((40-LEN(title$))/2,1)title$
 920 IF A%>0 THEN GOTO 960
 930 PRINT"There are no records to see"
 940 PRINT"Press space bar"
 950 REPEAT UNTIL GET=32:GOTO 1040
 960 FOR N=1 TO A%
 970 CLS
 980 PRINTTAB((40-LEN(title$))/2,1)title$
 990 PRINT"Record ";N''
1000 PROCprint
1010 PRINTTAB(5,23)"Press space bar";
1020 REPEAT UNTIL GET=32
1030 NEXT N
1040 ENDPROC
1050 :
1060 DEF PROCprint
1070 FOR n=1 TO F%
1080 PRINTdata$(n,0) TAB(12)data$(n,N)
1090 NEXT n
1100 ENDPROC
1110 :
1120 DEF PROCedit
1130 IF A%=0 THEN ENDPROC
1140 N=1
1150 REPEAT
1160 CLS
1170 PRINTTAB(14,1)"EDIT RECORDS"'
1180 PROCprint
1190 PRINTTAB(0,20)"  F..Forward
     B..Backward"
1200 PRINTTAB(0,21)"  E..Edit
     Q..Quit"
1210 A$=GET$
1220 IF A$="F" THEN N=N+1:IF N>A%
     THEN N=1
1230 IF A$="B" THEN N=N-1:IF N=0
     THEN N=A%
1240 IF A$="E" THEN PROCeditrecord
1250 UNTIL A$="Q"
1260 ENDPROC
1270 :
1280 DEF PROCeditrecord
1290 CLS
1300 PRINTTAB(0,1)"Change entry or press
     RETURN"'
```

Continued ▶

◀ Continued

```
1310 FOR T=1 TO F%
1320 PRINTdata$(T,0) TAB(12)data$(T,N)
1330 INPUTLINE TAB(11)"?"A$
1340 IF A$<>"" THEN data$(T,N)=A$
1350 NEXT T
1360 ENDPROC
1370 :
1380 DEF PROCenterfields
1390 CLS
1400 IF F%>0 THEN ENDPROC
1410 PRINTTAB(12,1)"FIELD NAME ENTRY"'
1415 INPUT"Enter title "title$
1420 INPUT"How many fields? (2-10)"F%
1430 IF F%<2 OR F%>10 THEN GOTO 1420
1440 FOR N=1 TO F%
1450 PRINT"Enter field name ";N;"  ";
1460 INPUT data$(N,0)
1470 NEXT N
1480 ENDPROC
```

Listing 2. The final version of the database

```
   1 REM Listing 2
  10 REM Simple database, version 7
  20 REM Martin Phillips
  30 REM (c) Acorn User March 1985
  40 REM Electron & BBC Micro
  50 :
  60 MODE6
  70 PROCinitialise
  80 PROCmenu
  90 END
 100 :
 110 DEF PROCinitialise
 120 VDU19,0,4,0,0,0
 130 VDU23;8202;0;0;0;
 140 A%=0:F%=0:printer$="off"
 150 DIM data$(10,100)
 160 ENDPROC
 170 :
 180 DEF PROCmenu
 190 REPEAT
 200 CLS
 210 PRINTTAB(18,1)"MENU"
 220 PRINTTAB(5,4)"1 Load records"
 230 PRINTTAB(5,6)"2 Enter field names"
 240 PRINTTAB(5,8)"3 Input records"
 250 PRINTTAB(5,10)"4 Save records"
 260 PRINTTAB(5,12)"5 Look at records"
 270 PRINTTAB(5,14)"6 Edit records"
 280 PRINTTAB(5,16)"7 End"
 290 PRINTTAB(5,18)"Enter choice ";
 300 A=GET-48
 310 IF A=1 THEN PROCload
 320 IF A=2 THEN PROCenterfields
 330 IF A=3 THEN PROCinput
 340 IF A=4 THEN PROCsave
 350 IF A=5 THEN PROClook
 360 IF A=6 THEN PROCedit
 370 UNTIL A=7
 380 CLS
 390 ENDPROC
 400 :
 410 DEF PROCinput
 420 IF A%=100 OR F%=0 THEN GOTO 530
 430 REPEAT
 440 A%=A%+1
 450 CLS
 460 PRINTTAB(13,1)"ENTER RECORDS"'
 470 FOR T=1 TO F%
 480 PRINTdata$(T,0);
 490 INPUTLINE TAB(12)data$(T,A%)
 500 NEXT T
 510 INPUT"Enter another record
     (Y/N)? "A$
 520 UNTIL A$="N" OR A$="n" OR A%=100
 530 ENDPROC
 540 :
 550 DEF PROCload
 560 CLS
 570 PRINTTAB(14,1)"LOAD RECORDS"'
 580 IF A%=0 THEN GOTO 610
 590 PRINT"ARE YOU SURE (Y/N)?"
 600 IF GET$<>"Y" THEN GOTO 720
 610 INPUT"Enter filename "file$
 620 A%=-1
 630 X=OPENIN(file$)
 640 INPUT #X,F%,title$
 650 REPEAT
 660 A%=A%+1
 670 FOR T=1 TO F%
 680 INPUT #X,data$(T,A%)
 690 NEXT T
 700 UNTIL EOF#X
 710 CLOSE #X
 720 ENDPROC
 730 :
 740 DEF PROCsave
 750 CLS
 760 PRINTTAB(14,1)"SAVE RECORDS"'
 770 IF A%=0 THEN GOTO 860
 780 INPUT"Enter filename "file$
 790 X=OPENOUT(file$)
 800 PRINT #X,F%,title$
 810 FOR N=0 TO A%
 820 FOR T=1 TO F%
 830 PRINT #X,data$(T,N)
 840 NEXT T,N
 850 CLOSE #X
 860 ENDPROC
 870 :
 880 DEF PROClook
 890 IF F%*A%=0 THEN GOTO 1040
 900 CLS
 910 PRINTTAB((40-LEN(title$))
     /2,1)title$
 920 PRINTTAB(5,4)"1 Turn printer on"
 930 PRINTTAB(5,6)"2 Turn printer off"
 940 PRINTTAB(5,8)"3 Search records"
 950 PRINTTAB(5,10)"4 Return
     to main menu"
 960 PRINTTAB(5,14)"Printer is
     ";printer$
 970 PRINTTAB(5,20)"Enter choice ";
 980 A=GET-48
 990 IF A=1 THEN printer$="on"
1000 IF A=2 THEN printer$="off"
1010 IF A=3 THEN PROCsearch
1020 IF A=4 THEN GOTO 1040
1030 GOTO 900
1040 ENDPROC
1050 :
1060 DEF PROCprint
1070 FOR n=1 TO F%
1080 PRINTdata$(n,0) TAB(12)data$(n,N)
1090 NEXT n
1100 ENDPROC
1110 :
1120 DEF PROCedit
```

Continued ▶

See 'Ever Increasing Circles', page 81

◀ Continued

```
1130 IF A%=0 THEN ENDPROC
1140 N=1
1150 REPEAT
1160 CLS
1170 PRINTTAB(14,1)"EDIT RECORDS"'
1180 PROCprint
1190 PRINTTAB(0,20)"  F..Forward
     B..Backward"
1200 PRINTTAB(0,21)"  E..Edit
     Q..Quit"
1210 A$=GET$
1220 IF A$="F" THEN N=N+1:IF N>A%
     THEN N=1
1230 IF A$="B" THEN N=N-1:IF N=0
     THEN N=A%
1240 IF A$="E" THEN PROCeditrecord
1250 UNTIL A$="Q"
1260 ENDPROC
1270 :
1280 DEF PROCeditrecord
1290 CLS
1300 PRINTTAB(0,1)"Change entry or
     press RETURN"'
1310 FOR T=1 TO F%
1320 PRINTdata$(T,0) TAB(12)data$(T,N)
1330 INPUTLINE TAB(11)"?"A$
1340 IF A$<>"" THEN data$(T,N)=A$
1350 NEXT T
1360 ENDPROC
1370 :
1380 DEF PROCenterfields
1390 CLS
1400 IF F%>0 THEN ENDPROC
1410 PRINTTAB(12,1)"FIELD NAME ENTRY"'
1415 INPUT"Enter title "title$
1420 INPUT"How many fields? (2-10)"F%
1430 IF F%<2 OR F%>10 THEN GOTO 1420
1440 FOR N=1 TO F%
1450 PRINT"Enter field name ";N;"  ";
1460 INPUT data$(N,0)
1470 NEXT N
1480 ENDPROC
1490 :
1500 DEF PROCsearch
1510 CLS
1520 PRINTTAB((40-LEN(title$))
     /2,1)title$'
1530 PRINT"These are the field names"'
1540 FOR N=1 TO F%
1550 PRINTTAB(5,N+3)N;"  ";data$(N,0)
1560 NEXT N
1570 PRINT'"Select number"
1580 A=GET-48
1590 PRINT"Search ";data$(A,0);" for:"
1600 INPUTsearch$
1610 FOR N=1 TO A%
1620 IF LEN(search$)>LEN(data$(A,N))
     THEN GOTO 1710
1630 IF INSTR(data$(A,N),search$)=0
     THEN GOTO 1710
1640 CLS
1650 IF printer$="on" THEN VDU2
1660 PRINT''
1670 PROCprint
1680 VDU3
1690 PRINTTAB(8,23)"Press
     space to continue";
1700 REPEAT:UNTIL GET=32
1710 NEXT N
1720 ENDPROC
```

Listing 3. To squeeze out the spaces between numbers

```
 1 REM Listing 3
10 INPUT"Which table? "table
20 FOR N=1 TO 10
30 PRINT N" x"table" ="N*table
40 NEXT N
```

Listing 1. Mike Williams' Basic program to draw circles

```
   10 REM Circle algorithm using
   20 REM potential function
   30 REM By Mike Williams
   40 REM for BBC and Electron
   50 REM (c) Acorn User March 1984
  100 :
  110 MODE0
  120 The_cows_come_home=FALSE
  130 :
  140 REPEAT
  150 centerx%=RND(1200)
  160 centery%=RND(1000)
  170 Radius%=RND(100)
  180 PROCcircle(centerx%,centery%,Radiu
s%)
  190 UNTIL The_cows_come_home
  200 END
  210 :
  220 DEF PROCcircle(centerx%,centery%,R
adius%)
  230 T%=0
  240 Yinc%=0
  250 Xinc%=Radius%
  260 K%=69
  270 :
  280 REPEAT
  290 Ty%=T%+Yinc%+1
  300 Txy%=Ty%-Xinc%+1
  310 circlex%=Xinc%*2:circley%=Yinc%*2
  320 PLOTK%,centerx%+circlex%,centery%+
circley%
  330 PLOTK%,centerx%+circlex%,centery%-
circley%
  340 PLOTK%,centerx%-circlex%,centery%-
circley%
  350 PLOTK%,centerx%-circlex%,centery%+
circley%
  360 PLOTK%,centerx%+circley%,centery%+
circlex%
  370 PLOTK%,centerx%+circley%,centery%-
circlex%
  380 PLOTK%,centerx%-circley%,centery%-
circlex%
  390 PLOTK%,centerx%-circley%,centery%+
circlex%
  400 T%=Ty%
  410 Yinc%=Yinc%+1
  420 IF ABS(Txy%)<ABS(Ty%) THEN T%=Txy%
:Xinc%=Xinc%-1
  430 UNTIL Xinc%<Yinc%
  440 ENDPROC
```

Techniques continued ▶

Listing 2. The machine code program to draw circles

```
   10 REM Machine Code Circles
   20 REM by Mike Williams
   30 REM for BBC and Electron
   40 REM (c) Acorn User
   50 :
  100 MODE 1
  110 PROCassemble
  120 PROCcheck
  130 REPEAT
  140 GCOL0,RND(3)
  150 Radius%=RND(40)
  160 Xcenter%=RND(1200)
  170 Ycenter%=RND(1000)
  180 CALL circle,Xcenter%,
      Ycenter%,Radius%
  190 IF RND(50)=25 THEN CLS
  200 UNTIL INKEY-99
  210 CLS:GOTO130
  220 :
  230 DEF PROCassemble
  240 loaddr=&88
  250 hiaddr=loaddr+1
  260 oswrch=&FFEE
  270 :
  280 FOR PASS=0 TO 2 STEP 2
  290 P%=&1200
  300 [OPT PASS
  310 \ Get variables from
  320 \ parameter block
  330 .circle LDY #1
  340 JSR parameter
  350 STA centerxlo
  360 INY
  370 LDA (loaddr),Y
  380 STA centerxhi
  390 LDY #4
  400 JSR parameter
  410 STA centerylo
  420 INY
  430 LDA (loaddr),Y
  440 STA centeryhi
  450 LDY #7
  460 JSR parameter
  470 STA radius
  480 \ Circle routine
  490 LDA #0
  500 STA Tvar
  510 STA Yinc
  520 LDA radius
  530 STA Xinc
  540 :
  550 .main_loop
  560 LDA #0
  570 STA circlexhi
  580 STA circleyhi
  590 LDA Tvar
  600 CLC
  610 ADC Yinc
  620 STA Ty
  630 INC Ty
  640 SEC
  650 SBC Xinc
  660 STA Txy
  670 INC Txy
  680 LDA Xinc
  689 \For Mode 0 omit next line
  690 ASL A:ROL circlexhi
  700 ASL A:ROL circlexhi
  710 STA circlex
  720 LDA Yinc
  729 \For Mode 0 omit next line
  730 ASL A:ROL circleyhi
  740 ASL A:ROL circleyhi
  750 STA circley
  760 \ Now plot the circle
  770 LDA centerxlo
  780 CLC
  790 ADC circlex
  800 STA vdu_table+3
  810 LDA centerxhi
  820 ADC circlexhi
  830 STA vdu_table+2
  840 LDA centerylo
  850 CLC
  860 ADC circley
  870 STA vdu_table+1
  880 LDA centeryhi
  890 ADC circleyhi
  900 STA vdu_table
  910 JSR plot
  920 :
  930 LDA centerylo
  940 SEC
  950 SBC circley
  960 STA vdu_table+1
  970 LDA centeryhi
  980 SBC circleyhi
  990 STA vdu_table
 1000 JSR plot
 1010 :
 1020 LDA centerxlo
 1030 SEC
 1040 SBC circlex
 1050 STA vdu_table+3
 1060 LDA centerxhi
 1070 SBC circlexhi
 1080 STA vdu_table+2
 1090 JSR plot
 1100 :
 1110 LDA centerylo
 1120 CLC
```

```
1130 ADC circley
1140 STA vdu_table+1
1150 LDA centeryhi
1160 ADC circleyhi
1170 STA vdu_table
1180 JSR plot
1190 LDA centerxlo
1200 CLC
1210 ADC circley
1220 STA vdu_table+3
1230 LDA centerxhi
1240 ADC circleyhi
1250 STA vdu_table+2
1260 LDA centerylo
1270 CLC
1280 ADC circlex
1290 STA vdu_table+1
1300 LDA centeryhi
1310 ADC circlexhi
1320 STA vdu_table
1330 JSR plot
1340 LDA centerylo
1350 SEC
1360 SBC circlex
1370 STA vdu_table+1
1380 LDA centeryhi
1390 SBC circlexhi
1400 STA vdu_table
1410 JSR plot
1420 :
1430 LDA centerxlo
1440 SEC
1450 SBC circley
1460 STA vdu_table+3
1470 LDA centerxhi
1480 SBC circleyhi
1490 STA vdu_table+2
1500 JSR plot
1510 LDA centerylo
1520 CLC
1530 ADC circlex
1540 STA vdu_table+1
1550 LDA centeryhi
1560 ADC circlexhi
1570 STA vdu_table
1580 JSR plot
1590 :
1600 :
1610 LDA Ty
1620 STA Tvar
1630 INC Yinc
1640 LDA Ty
1650 JSR abs
1660 STA tempAstore
1670 LDA Txy
1680 JSR abs
1690 CMP tempAstore
1700 BCS loop_jump
1710 LDA Txy
1720 STA Tvar
1730 DEC Xinc
1740 .loop_jump
1750 LDA Xinc
1760 CMP Yinc
1770 BCC done
1780 JMP main_loop
1790 .done
1800 RTS
1810 :
1820 .abs
1830 BMI minus
1840 RTS
1850 .minus
1860 EOR #&FF
1870 CLC
1880 ADC #1
1890 RTS
1900 :
1910 .plot
1920 LDY #5
1930 .plot_loop
1940 LDA vdu_table,Y
1950 JSR oswrch
1960 DEY
1970 BPL plot_loop
1980 RTS
1990 :
2000 .parameter
2010 LDA &600,Y
2020 STA loaddr
2030 LDA &601,Y
2040 STA hiaddr
2050 LDY #0
2060 LDA (loaddr),Y
2070 RTS
2080 :
2090 .tempAstore BRK
2100 .Tvar BRK
2110 .Xinc BRK
2120 .Yinc BRK
2130 .Ty BRK
2140 .Txy BRK
2150 .radius BRK
2160 .centerxlo BRK
2170 .centerxhi BRK
2180 .centerylo BRK
2190 .centeryhi BRK
2200 .circlex BRK
2210 .circlexhi BRK
2220 .circley BRK
2230 .circleyhi BRK
2240 .vdu_table BRK:BRK
2250 ]
2260 NEXT PASS
2270 !(vdu_table+2)
     =&19450000
2280 ENDPROC
2290 :
2300 DEF PROCcheck
2310 Q%=0
2320 FOR R%=&1200
     TO &13AD
2330 Q%=Q%+?R%
2340 NEXT
2350 IF Q%=42193
     THEN ENDPROC
2360 CLS : VDU 7
2370 PRINT "Checksum
     Error :";Q%
2380 END
```

Mike Williams has also written an extra-quick machine code program to draw circles, based on the same algorithm. It can be found on both our monthly listings cassette for March (see page 96 for the order form) and in bar code format in our bar code listings booklet (see page 108 for details).

See 'Go for Graphics', page 85

Listing 1. Nigel Beasley's program to add 16 colour graphics to mode 7

```
10 REM Mode 7 Graphics
20 REM By Nigel Beasley
30 REM for BBC Micro only
40 REM (c) Acorn User March 1985
50 :
60 REM Initialise variable stores
70 S%=&80:!S%=&08040201:S%!4=&4010
80 X_store=&70:Y_store=&71
90 Divisor_1=&72:?Divisor_1=3
100 X_target=&73:Y_target=&74
110 X_origin=&75:Y_origin=&76
120 X_movement=&77:Y_movement=&78
130 Absolute_X_movement=&79
140 Absolute_Y_movement=&7A
150 Multiplier=&7B:Multiplied=&7D
160 Result=&7E
170 Store_1=&8C:Store_2=&8D
180 Store_3=&8E
190 Quotient=&88:Divisor=&89
200 :
210 REM Assemblè program
220 FOR pass=0 TO 3 STEP 3
230 P%=&1700
240 OSWRCH=&FFEE
250 [OPT pass
260 \procedure to plot a pixel
270 .Pixel_Plot
280 LDA Y_store
290 CMP #71
300 BPL Finish
310 STA Store_1
320 LDA X_store
330 CMP #71
340 BPL Finish
350 \divide Y by 3
360 \screen is 25 squares vertically
370 \
380 LDA #0
390 LDX #8
400 .Loop
410 ASL Store_1
420 ROL A
430 CMP Divisor_1
440 BCC Less_1
450 SBC Divisor_1
460 INC Store_1
470 .Less_1
480 DEX
490 BNE Loop
500 STA Store_2
510 LDA #31
520 JSR OSWRCH
530 LDA X_store
540 ROR A
550 CLC
560 ADC #3
570 \move 3 pixels to right
580 \so no to be graphics code
590 JSR OSWRCH
600 LDA #25
610 SBC Store_1
620 JSR OSWRCH
630 \ the cursor is now
640 \ at position X,Y on screen
650 LDA X_store
660 AND #1
670 STA Store_1
680 LDA #3
690 SBC Store_2
700 STA Store_3
710 CLC
720 ADC Store_3
730 ADC Store_1
740 TAX
750 LDA S%,X
760 STA Store_1
770 LDA #135
780 JSR &FFF4
790 TXA
800 ORA Store_1
810 ORA #128
820 JSR OSWRCH
830 .Finish
840 RTS
850 \
860 \ Procedures to draw a line
870 \
880 .START
890 LDA X_target
900 BMI Finish_1
910 SEC
920 SBC X_origin
930 STA X_movement
940 BPL X_positive
950 EOR #&FF
960 CLC
970 ADC #1
980 .X_positive
990 STA Absolute_X_movement
1000 \ end if Y target is negative
1010 LDA Y_target
1020 BMI Finish_1
1030 \calculate Y direction distance
1040 SEC
1050 SBC Y_origin
1060 STA Y_movement
1070 BPL Y_positive
1080 EOR #&FF
1090 CLC
1100 ADC #1
1110 .Y_positive
1120 STA Absolute_Y_movement
1130 BNE Over
1140 LDA Absolute_X_movement
1150 BNE Over
1160 .Finish_1
1170 RTS
1180 \
1190 .Over
1200 LDA Absolute_Y_movement
1210 CMP Absolute_X_movement
1220 BMI X_greater
1230 JMP Y_greater
1240 \
1250 \ X is greater then Y
1260 \
1270 .X_greater
1280 STA Multiplier
1290 LDA Absolute_X_movement
1300 STA Divisor
1310 LDA #0
1320 STA Divisor+1
1330 LDA X_origin
1340 STA X_store
1350 LDA X_movement
1360 BMI Beginning_2
1370 \ routine to calculate positions
1380 \ of pixels on line to be filled
1390 \ if X>Y and line moves to right
1400 \
1410 .Beginning_1
1420 LDA X_store
1430 SEC
1440 SBC X_origin
1450 JSR Multiply_divide
1460 LDA Y_movement
1470 BMI X_pos__Y_neg
1480 LDA Result
1490 CLC
1500 ADC Y_origin
```

```
1510 JMP End_1
1520 .X_pos__Y_neg
1530 LDA Y_origin
1540 SEC
1550 SBC Result
1560 .End_1
1570 STA Y_store
1580 JSR Pixel_Plot
1590 INC X_store
1600 LDA X_store
1610 CMP X_target
1620 BNE Beginning_1
1630 JMP End
1640 \
1650 \ If X>Y and line moves
1660 \ left then this routine used
1670 \
1680 .Beginning_2
1690 LDA X_origin
1700 SEC
1710 SBC X_store
1720 JSR Multiply_divide
1730 LDA Y_movement
1740 BMI X_neg__Y_neg
1750 LDA Result
1760 CLC
1770 ADC Y_origin
1780 JMP End_2
1790 .X_neg__Y_neg
1800 LDA Y_origin
1810 SEC
1820 SBC Result
1830 .End_2
1840 STA Y_store
1850 JSR Pixel_Plot
1860 DEC X_store
1870 LDA X_store
1880 CMP X_target
1890 BNE Beginning_2
1900 JMP End
1910 \ Y movement is greater
1920 \ than the X movement
1930 .Y_greater
1940 STA Divisor
1950 LDA #0
1960 STA Divisor+1
1970 LDA Absolute_X_movement
1980 STA Multiplier
1990 LDA Y_origin
2000 STA Y_store
2010 LDA Y_movement
2020 BMI Beginning_4
2030 \
2040 \ line drawing routine if Y>X
2050 \ and line moving up
2060 \
2070 .Beginning_3
2080 LDA Y_store
2090 SEC
2100 SBC Y_origin
2110 JSR Multiply_divide
2120 LDA X_movement
2130 BMI Y_pos__X_neg
2140 LDA Result
2150 CLC
2160 ADC X_origin
2170 JMP End_3
2180 .Y_pos__X_neg
2190 LDA X_origin
2200 SEC
2210 SBC Result
2220 .End_3
2230 STA X_store
2240 JSR Pixel_Plot
2250 INC Y_store
2260 LDA Y_store
2270 CMP Y_target
2280 BNE Beginning_3
2290 JMP End
2300 \
2310 \ procedure used if Y>X
2320 \ and line moves down
2330 \
2340 .Beginning_4
2350 LDA Y_origin
2360 SEC
2370 SBC Y_store
2380 JSR Multiply_divide
2390 LDA X_movement
2400 BMI Y_neg__X_neg
2410 LDA Result
2420 CLC
2430 ADC X_origin
2440 JMP End_4
2450 .Y_neg__X_neg
2460 LDA X_origin
2470 SEC
2480 SBC Result
2490 .End_4
2500 STA X_store
2510 JSR Pixel_Plot
2520 DEC Y_store
2530 LDA Y_store
2540 CMP Y_target
2550 BNE Beginning_4
2560 JMP End
2570 \
2580 .End
2590 LDA X_target
2600 STA X_origin
2610 LDA Y_target
2620 STA Y_origin
2630 RTS
2640 \
2650 \ this routine takes X or Y and
2660 \ calculates other value
2670 \ ie given X it would calculate Y
2680 \
2690 .Multiply_divide
2700 STA Multiplied
2710 LDA #0
2720 STA Result
2730 LDX #8
2740 .Loop_2
2750 LSR Multiplied
2760 BCC Zero
2770 CLC
2780 ADC Multiplier
2790 .Zero
2800 ROR A
2810 ROR Result
2820 DEX
2830 BNE Loop_2
2840 STA Result+1
2850 LDA #0
2860 STA Quotient
2870 LDX #16
2880 .Loop_1
2890 ASL Result
2900 ROL Result+1
2910 ROL A
2920 TAY
2930 ROL Quotient
2940 CMP Divisor
2950 LDA Quotient
2960 SBC Divisor+1
2970 BCC Less
2980 TYA
2990 SBC Divisor
3000 TAY
```

Continued ▶

◀ Continued

```
3010 LDA Quotient
3020 SBC Divisor+1
3030 STA Quotient
3040 INC Result
3050 .Less
3060 TYA
3070 DEX
3080 BNE Loop_1
3090 RTS
3100  ]
3110 NEXT
3120 *SAVE "PLOT" 1700 +200
```

Listing 2. Draw a face with the demonstration program

```
 10 REM Mode 7 Graphics Demo
 20 REM by Nigel Beasley
 30 REM for BBC Micro Only
 40 REM (C) Acorn User March 1985
 50 :
 60 MODE 7
 70 PROCINIT
 80 :
 90 REM White plot on black
100 PROCGR("WHITE","BLACK")
110
120 REM Reset data pointer
130 RESTORE 160
140 :
150 PROCMOVE(1,61):PROCD :   REM "M"
160 DATA 1,67,3,65,5,67,5,61,100,0
170 PROCMOVE(9,61):PROCD :   REM "O"
180 DATA 7,63,7,65,9,67,11,65
190 DATA 11,63,9,61,100,0
200 PROCMOVE(13,61):PROCD : REM "D"
210 DATA 13,67,15,67,17,65,17
220 DATA 63,15,61,13,61,100,0
230 PROCMOVE(23,61):PROCD : REM "E"
240 DATA 19,61,19,67,22,67,100,0
250 PROCMOVE(19,64):PROCDRAW(21,64)
260 PROCMOVE(56,61):PROCD : REM "7"
270 DATA 59,67,54,67,100,0
280 PROCMOVE(16,8):PROCD  : REM "G"
290 DATA 12,8,12,2,15,2,15,5,16
300 DATA 5,100,0
310 PROCMOVE(18,2):PROCD   : REM "R"
320 DATA 18,8,22,8,22,5,19,5,22,2,100,0
330 PROCMOVE(24,2):PROCD   : REM "A"
340 DATA 24,8,28,8,28,2,100,0
350 PROCMOVE(24,5):PROCDRAW(28,5)
360 PROCMOVE(30,2):PROCD   : REM "P"
370 DATA 30,8,34,8,34,5,31,5,100,0
380 PROCMOVE(36,2):PROCDRAW(36,8)
390 PROCMOVE(36,5):PROCDRAW(40,5):
400 PROCMOVE(40,2)
410 PROCDRAW(40,8):          REM "H"
420 PROCMOVE(42,2):PROCDRAW(46,2)
430 PROCMOVE(44,2):PROCDRAW(44,8)
440 PROCMOVE(42,8)
450 PROCDRAW(46,8):          REM "I"
460 PROCMOVE(52,2):PROCD :   REM "C"
470 DATA 48,2,48,8,52,8,100,0
480 PROCMOVE(54,2):PROCD :   REM "S"
490 DATA 58,2,58,5,54,5,54,8
500 DATA 58,8,100,0
510 :
520 REM Start Graphics
530 PROCGR("BLUE","YELLOW")
540 :
550 REM Plot a circle
560 FOR A=0 TO 2*PI STEP .04
570 X=35+22*SIN(A)
580 Y=35+22*COS(A)
590 PROCPLOT(X,Y)
600 NEXT
610 :
620 REM Foregrd green, backgrd red
630 PROCGR("GREEN","RED")
640 RESTORE 680
650 :
660 REM draw the face
670 PROCMOVE(13,25):PROCD:REM Left ear
680 DATA 10,25,7,30,7,39,10,44
690 DATA 13,44,100,0
700 PROCMOVE(56,25):PROCD:REM Right ear
710 DATA 59,25,61,30,61,39,59
720 DATA 44,56,44,100,0
730 PROCMOVE(34,57):PROCD:REM Left hair
740 DATA 31,66,29,68,100,0
750 PROCMOVE(36,57):PROCD:REM Rt hair
760 DATA 38,66,40,68,100,0
770 PROCMOVE(34,37):PROCD :REM Nose
780 DATA 34,34,30,27,39,27,35
790 DATA 33,35,37,100,0
800 PROCMOVE(22,24):PROCD :REM Mouth
810 DATA 25,24,32,21,37,21,44,24
820 DATA 47,24,41,18,38,17,31,17
830 DATA 28,18,22,24,100,0
840 :
850 REM Draw eyes
860 FORA=0 TO 2*PI STEP .2
870 PROCPLOT(25+5*SIN(A),42+4*COS(A))
880 PROCPLOT(45+5*SIN(A),42+4*COS(A))
890 NEXT
900 :
910 REM Draw teeth and pupils
920 READX,Y
930 IFX=100THEN1010
940 PROCPLOT(X,Y)
950 GOTO920
960 DATA 32,18,33,18,32,19,33,19
970 DATA 35,19,36,19,35,20,36,20
980 DATA 24,41,25,41,24,42,25,42
990 DATA 44,41,45,41,44,42,45,42,100,0
1000 :
1010 VDU 30
1020 REPEAT
1030 PROCGR("MAGENTA","CYAN")
1040 FOR A=1 TO 2000:NEXT
1050 PROCGR("CYAN","MAGENTA")
1060 FOR A=1 TO 1000:NEXT
1070 UNTIL FALSE
1080 END
1090 :
1100 REM Draw Procedures
1110 DEF PROCD
1120 READ X,Y
1130 IF X=100 THEN ENDPROC
1140 PROCDRAW(X,Y)
1150 GOTO1120
1160 :
1170 REM Initialisation
1180 DEF PROCINIT
1190 *LO."PLOT" 1700
1200 S%=&80:!S%=&08040201:S%!4=&4010
1210 ?&72=3
1220 X_target=&73:Y_target=&74
1230 X_origin=&75:Y_origin=&76
1240 X_store=&70:Y_store=&71
1250 Pixel_plot=&1700
1260 START=Pixel_plot+&5B
1270 ENDPROC
1280 :
1290 REM Proc to set colours
1300 DEF PROCGR(C$,B$)
1310 LOCAL Z%,B%,C%
1320 VDU 30
```

Continued ▶

See 'Beeb Forum', page 115

Listing 1. Stephen Phelps' program to catch erroneous Is and Os

```
10 REM Throwing out a Challenge
20 REM Catch I's and O's
30 REM by Stephen Phelps
40 REM For BBC and Elk
50 REM Beeb Forum March 1985
60 REM (C) Acorn User
70 :
80 counter=&70
90 page=&72
100 oldvector=&74
110 FOR PASS=0 TO 3 STEP 3
120 P%=&A00
130 [OPT PASS
140 .change
150 LDY#0
160 LDA page:STA counter
170 LDA page+1:STA counter+1
180 .loop
190 JSR inccounter
200 LDA (counter),Y
210 CMP#ASC"="
220 BNE notchangeothers
230 JSR changeothers
240 .notchangeothers
250 LDA (counter),Y
260 CMP#&FF:BNE loop
270 RTS
280 :
290 .inccounter
300 LDA counter
310 CLC
320 ADC#1
330 STA counter
340 LDA counter+1:ADC#0
350 STA counter+1
360 RTS
370 :
380 .changeothers
390 JSR inccounter
400 LDA (counter),Y
410 CMP#ASC""""
420 BEQ exit
430 .reploop
440 LDA (counter),Y
450 CMP#ASC":":BEQ exit
460 LDA (counter),Y
470 CMP#ASC"""":BEQ exit
480 LDA (counter),Y
490 CMP#ASC"I":
500 BNE notchangeto1
510 JSR changeto1
520 .notchangeto1
530 LDA (counter),Y
540 CMP#ASC"i"
550 BNE notchangeto12
560 JSR changeto1
570 .notchangeto12
580 LDA (counter),Y
590 CMP#ASC"O"
600 BNE notchangeto0
610 JSR changeto0
620 .notchangeto0
630 LDA (counter),Y
640 CMP#ASC"o"
650 BNE notchangeto02
660 JSR changeto0
670 .notchangeto02
680 LDA (counter),Y
690 CMP#ASC"0":BCC exit
700 CMP#ASC":":BCS exit
710 LDA (counter),Y
720 CMP#&D:BEQ exit
730 JSR inccounter
```

continued ▶

◀ continued

```
1330 IF C$="BLACK" PRINT"Illegal graphic
s colour":END
1340 RESTORE 1560
1350 C%=0:
1360 REPEAT READ COL$:C%=C%+1
1370 UNTIL C$=COL$ OR C%=8
1380 IF B$="BLACK" THEN VDU C%+144,32,32
ELSE 1440
1390 REM Put graphics codes down screen
1400 FOR Z%=0 TO 23
1410 VDU 10,13,C%+144,32,32
1420 NEXT
1430 GOTO 1540
1440 RESTORE 1560
1450 B%=0
1460 REPEAT READ COL$
1470 B%=B%+1
1480 UNTIL B$=COL$ OR B%=8
1490 VDU B%+128,157,C%+144
1500 REM Put codes down
1510 FOR Z%=0 TO 23
1520 VDU 10,13,B%+128,157,C%+144
1530 NEXT
1540 ?X_origin=0:?Y_origin=0
1550 ENDPROC
1560 DATA RED,GREEN,YELLOW,BLUE
1570 DATA MAGENTA,CYAN,WHITE
1580 :
1590 DEF PROCDRAW(X%,Y%)
1600 ?X_target=X%:?Y_target=Y%
1610 CALL START
1620 PROCPLOT(X%,Y%)
1630 ENDPROC
1640 :
1650 DEF PROCMOVE(X%,Y%)
1660 VDU 31,X%/2,Y%/3
1670 ?X_origin=X%:?Y_origin=Y%
1680 ENDPROC
1690 :
1700 DEF PROCPLOT(X%,Y%)
1710 ?X_store=X%:?Y_store=Y%
1720 CALL Pixel_plot
1730 ENDPROC
```

◀ *Continued*

```
740 JMP reploop
750 .exit
760 RTS
770 :
780 .changeto1
790 LDA#ASC"1":STA (counter),Y
800 RTS
810 :
820 .changeto0
830 LDA#ASC"0":STA (counter),Y
840 RTS
850 :
860 .call
870 SEI
880 PHA:PHP
890 TXA:PHA:TYA:PHA
900 CPY#13:BNE exitcall
910 JSR change
920 .exitcall
930 PLA:TAY:PLA:TAX:PLP:PLA
940 CLI
950 JMP (oldvector)
960 :
970 .init
980 SEI
990 LDA &220:STA oldvector
1000 LDA &221:STA oldvector+1
1010 LDA#call MOD 256:STA &220
1020 LDA#call DIV 256:STA &221
1030 CLI
1040 RTS
1050 ]NEXT
1060 !page=PAGE
1070 *FX14,2
1080 CALLinit
1090 *K.10 *FX14,2|MCA.&A00|M
```

Listing 2. Peter Gregory's program to replace VDU 19s with events

```
    1 REM Eventful Colours
    2 REM by Peter Gregory
    3 REM for BBC and Elk
    4 REM (c) Acorn User March 1985
    5 :
   10 block_vector=&F8:vector_list_stora
ge=&70
   20 number_of_colours_available_in_cur
rent_screen_mode=&360
   30 osword=&FFF1
   40 IFPAGE<&1000 DIMStart_of_machine_c
ode_routine% 256 ELSE Start_of_machine_c
ode_routine%=&F00
   50 FOR assembler_pass_option%=0 TO 3
STEP3
   60 P%=Start_of_machine_code_routine%
   70 [OPT assembler_pass_option%
   80. PHP
   90 CMP #5:BNE Out
  100 PHA:TXA:PHA:TYA:PHA:
  110 LDA Present_interrupt_driven_colou
r_cycle
  120 CLC:ADC #1:CMP number_of_interrupt
_driven_colour_cycles:BNE Increment_the_
present_interrupt_driven_colour_cycle
  130 LDA #0::.Increment_the_present_int
errupt_driven_colour_cycle STA Present_i
nterrupt_driven_colour_cycle
  140 ASL A:TAX::LDA vector_list_storage
,X:STA block_vector
  150 :LDA vector_list_storage+1,X:STA b
lock_vector+1::
  160 LDY #1::.update_interval_timer_loo
p LDA (block_vector),Y
  170 STA interval_timer_block,Y:DEY:BPL
 update_interval_timer_loop
  180 ::LDY #2:LDA (block_vector),Y:CMP
number_of_colours_available_in_current_s
creen_mode
  190 BCS exit:STA colours_to_go::
  200 LDA #0:STA logical_colour
  210 .colour_loop INY:INC logical_colou
r:LDA (block_vector),Y:STA physical_colo
ur:STY marker
  220 LDY #logical_colour DIV256:LDX #lo
gical_colour AND255:LDA #&0C:JSR osword
  230 :LDY marker:DEC colours_to_go:BNE
colour_loop::
  240 LDA #4:LDX #interval_timer_block M
OD256:LDY #interval_timer_block DIV256:J
SR osword::
  250 .exit PLA:TAY:PLA:TAX:PLA:.Out PLP
:RTS:::
  260 .logical_colour EQUB 0
  270 .physical_colour EQUD 0
  280 .interval_timer_block EQUW-8:EQUW
-1:EQUB-1
  290 .marker EQUB0
  300 .colours_to_go EQUB0
  310 .Present_interrupt_driven_colour_c
ycle EQUB0
  320 .number_of_interrupt_driven_colour
_cycles EQUB0
  330 ]NEXT:PRINT'"Assembled at &";~Star
t_of_machine_code_routine%;" to &";~P%;"
     Length =&";~P%-Start_of_machine_cod
e_routine%;" ("P%-Start_of_machine_code_
routine%;") bytes"+CHR$3
  340 END
  350 DEFPROCColours:IF?&355<>2 THEN PRI
NT"Not mode 2";:ENDPROC
  360 RESTORE380:FORC%=1 TO7:COLOURC%:RE
ADC$:PRINT"Colour ";C%;" (";C$;")":NEXT
  370 ENDPROC
  380 DATARED,GREEN,YELLOW,BLUE,MAGENTA,
CYAN,WHITE
  390 DEFPROCBLOCK:?&70=16:?&72=32:?&74=
48:?&71=13:?&73=13:?&75=13
  400 ?&D10=-100:?&D11=-1:?&D12=3:?&D13=
1:?&D14=0:?&D15=0
  410 ?&D20=-50:?&D21=-1:?&D22=3:?&D23=0
:?&D24=2:?&D25=0
  420 ?&D30=-20:?&D31=-1:?&D32=3:?&D33=0
:?&D34=0:?&D35=3
  430 ?number_of_interrupt_driven_colour
_cycles=3:?Present_interrupt_driven_colo
ur_cycle=0:Y%=5
  440 ?&220=Start_of_machine_code_routin
e%:?&221=Start_of_machine_code_routine%
DIV256:*FX14 1
  450 REMARKABLE Routine starts when use
r does a CALL&FFBF
  460 ENDPROC
```

See 'Second Keyboard? It's as easy as ADC', page 119

Listing 1. Paul Beverley's program to run the second keyboard

```
   10 REM Keyboard on ADC input
   20 REM by Paul Beverley
   30 REM For BBC and Electron-Plus1
   32 REM (C) Acorn User March 1985
   35 :
   40 CLS
   50 INPUT"Adjust variable control",L$
   60 IF L$>"N" PROCsetkeys
   70 PROCsetup_variables
   80 PROCassemble(&C00)
   90 PRINT" *SAVE AKEYS ";~start" ";~P%
" ";~start
  100 CALL start
  110 END
  120 :
  130 DEFPROCassemble(M%)
  140 *FX13,3
  150 FOR opt=0 TO 2 STEP 2
  160 P%=M%
  170 [OPT opt
  180 \
  190 .start
  200 LDA #newEVNTV MOD 256
  210 STA EVNTV
  220 LDA #newEVNTV DIV 256
  230 STA EVNTV + 1
  240 LDA #14
  250 LDX #3
  260 JSR OSBYTE
  270 LDA #16
  280 LDX #1
  290 JSR OSBYTE
  300 \
  310 .no_char
  320 LDA #0
  330 STA last_char
  340 STA count
  350 RTS
  360 \
  370 .newEVNTV
  380 LDA count
  390 BEQ check_channel
  400 DEC count
  410 RTS
  420 \
  430 .check_channel
  440 CPX #1
  450 BNE return
  460 \
  470 LDA &2BA
  480 LSR A
  490 LSR A
  500 LSR A
  510 BEQ no_char
  520 \
  530 CMP last_char
  540 STA last_char
  550 BNE return
  560 \
  570 STX tempstore
  580 TAY
  590 LDA table,Y
  600 TAY
  610 LDA #138
  620 LDX #0
  630 JSR OSBYTE
  640 LDX tempstore
  650 LDA #delay
  660 STA count
  670 .return
  680 RTS
  690 ]
  700 table=P%
  710 $(table+1)=character$
  720 NEXT
  730 P%=P%+LEN(character$)+1
  740 ENDPROC
  750 :
  760 DEFPROCsetup_variables
  770 character$="abcdefghijklmnopqrstuv
wxyz0123"
  780 delay=10
  790 tempstore=&8D:REM or &C7D
  800 last_char=&8E:REM or &C7E
  810 count=&8F:REM or &C7F
  820 EVNTV=&220
  830 OSBYTE=&FFF4
  840 ENDPROC
  850 :
  860 DEF PROCsetkeys
  870 REPEAT
  880 PRINT ADVAL1 DIV 2048
  890 UNTIL INKEY(0)>0
  900 ENDPROC
```

Listing 2. Program to run second keyboard with selectable character sets

```
   10 REM Select character set version
   20 REM by Paul Beverley
   30 REM BBC Micro and Electron-Plus1
   40 REM (c) Acorn User March 1985
   45 :
   50 CLS
   60 INPUT"Adjust variable control",L$
   70 IF L$>"N" PROCsetkeys
   80 PROCsetup_variables
   90 PROCassemble(&C00)
  100 PRINT" *SAVE AKEYS ";~start" ";~st
art+256" ";~start
  110 CALL start
  120 END
  130 :
  140 DEFPROCassemble(M%)
  150 *FX13,3
  160 FOR opt=0 TO 2 STEP 2
  170 P%=M%
  180 [OPTopt
  190 \
  200 .start
  210 LDA #newEVNTV MOD 256
  220 STA EVNTV
  230 LDA #newEVNTV DIV 256
  240 STA EVNTV + 1
  250 LDA #table1 DIV 256
  260 STA table_pointer+1
  270 LDA #&80
  280 STA table_pointer
  290 LDA #14
  300 LDX #3
  310 JSR OSBYTE
  320 LDA #16
  330 LDX #1
  340 JSR OSBYTE
  350 \
  360 .no_char
```

Continued ▶

◀ Continued

```
370 LDA #0
380 STA last_char
390 STA count
400 RTS
410 \
420 .newEVNTV
430 LDA count
440 BEQ check_channel
450 DEC count
460 RTS
470 \
480 .check_channel
490 CPX #1
500 BNE return
510 \
520 LDA &2BA
530 LSR A
540 LSR A
550 LSR A
560 BEQ no_char
570 \
580 CMP last_char
590 STA last_char
600 BNE return
610 \
620 CMP #4
630 BCS read_table
640 \
650 TAY
660 LDA #&60
670 CLC
680 .next
690 ADC #&20
700 DEY
710 BNE next
720 STA table_pointer
730 JMP no_char
740 \
750 .read_table
760 STX tempstore
770 TAY
780 LDA (table_pointer),Y
790 TAY
800 LDA #138
810 LDX #0
820 JSR OSBYTE
830 LDX tempstore
840 LDA #delay
850 STA count
860 .return
870 RTS
880 ]
890 NEXT
900 table1=M%+&84
910 table2=M%+&A4
920 table3=M%+&C4
930 $table1=characters1$
940 $table2=characters2$
950 $table3=characters3$
960 ENDPROC
970 :
980 DEFPROCsetup_variables
990 characters1$ = "abcdefghijklmnopqr
stuvwxyz"
1000 characters2$ = "ABCDEFGHIJKLMNOPQR
STUVWXYZ"
1010 characters3$ = "0123456789"
1020 FOR char%=&80 TO &8F
1030 characters3$ = characters3$ + CHR$
(char%)
1040 NEXT
1050 delay=20
1060 tempstore=&C7B
1070 last_char=&C7C
1080 count=&C7D
1090 table_pointer=&8E:REM or &90
1100 EVNTV=&220
1110 OSBYTE=&FFF4
1120 ENDPROC
1130 :
1140 DEF PROCsetkeys
1150 REPEAT
1160 PRINT ADVAL1 DIV 2048
1170 UNTIL INKEY(0)>0
1180 ENDPROC
```

See 'Ten Times Test', page 167

Listing 1. George Hill's screen dump for the Fastext 80

```
 10 REM FASDUMP - Modes 1,4 or 5
 20 REM by George Hill
 30 REM BBC and Electron-Plus1
 40 REM Printers with ESC * 5 command
 50 REM FX80, Taxan, Canon, Fastext80
 60 :
 70 REM Four bytes each for patterns
 80 DIM pattern1% 3,pattern2% 3
 90 !pattern1%=&03020100
100 !pattern2%=&03030000
110 :
120 REM Set linefeed
130 VDU2,1,27,1,ASC"A",1,8
140 REM Clear paper
150 VDU1,13,1,10
155 :
160 REM Scan screen
170 FOR X%=0 TO 1272 STEP 16
180 REM Send ESC * 5 0 2
190 REM 512 dots per line
200 VDU1,27,1,ASC"*",1,5,1,0,1,2
210 FOR Y%=0 TO 1020 STEP 4
220 byte1%=0
230 byte2%=0
240 REM Prepare two bytes
250 FOR x%=0 TO 12 STEP 4
260 byte1%=byte1%*4
270 byte2%=byte2%*4
280 colour%=POINT(X%+x%,Y%)
290 byte1%=byte1%+pattern1%?colour%
300 byte2%=byte2%+pattern2%?colour%
310 NEXT
320 VDU1,byte1%,1,byte2%
330 NEXT
340 VDU1,10
350 NEXT
360 REM Reset linefeed to 1/6 inch
370 VDU1,27,1,50
380 REM Formfeed and disable
390 VDU1,12,3
```

Listing 2. Two-line program to dump Mode 1, 4 or 5 screens

```
30000DIMP%3,Q%3:!P%=&03020100:!Q%=&03030
000
30010VDU2,1,27,1,65,1,8,1,13,1,10:FORX%=
0TO1272STEP16:VDU1,27,1,42,1,5,1,0,1,2:F
ORY%=0TO1020STEP4:A%=0:B%=0:FORZ%=0TO12S
TEP4:A%=A%*4:B%=B%*4:C%=POINT(X%+Z%,Y%):
A%=A%+P%?C%:B%=B%+Q%?C%:NEXT:VDU1,A%,1,B
%:NEXT:VDU1,10:NEXT:VDU1,27,1,50,1,12,3
```

A further listing, the Fastext 80 test program, is available on the monthly cassette and in the bar code listings booklet.

Listing 3. A similar dump for mode 2 screens

```
30000DIMP%7,Q%7:!P%=&05040200:P%!4=&0F07
0C05:!Q%=&04010000:Q%!4=&0F0C050A:VDU2,1
,27,1,65,1,8,1,13,1,10
30010FORX%=0TO1272STEP16:VDU1,27,1,42,1,
5,1,0,1,2:FORY%=0TO1020STEP4:A%=0:B%=0:F
ORZ%=0TO8STEP8:C%=POINT(X%+Z%,Y%)MOD8:A%
=A%*16:B%=B%*16:A%=A%+P%?C%:B%=B%+Q%?C%:
NEXT:VDU1,A%,1,B%:NEXT:VDU1,10:NEXT:VDU1
,27,1,50,1,12,3
```

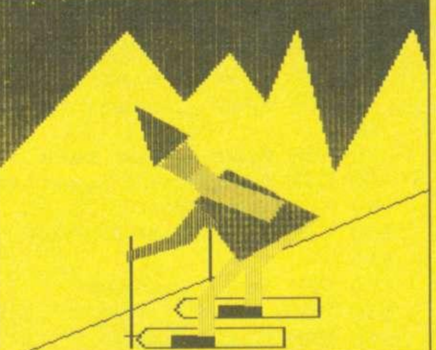
Listing 4. 10-year-old Miranda Hill's program to draw a skier

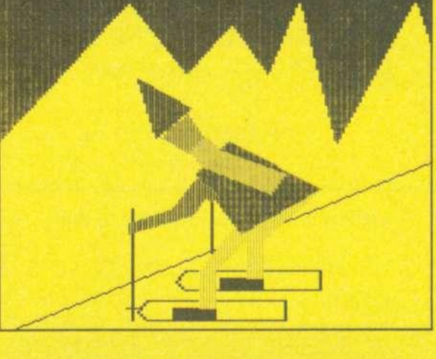
```
 10 REM Skier
 11 REM by Miranda Hill Aged 10
 12 REM for BBC and Electron-Plus1
 13 REM (c) Acorn User March 1985
 15 :
 20 MODE2
 30 VDU19,7,0,0,0,0
 40 VDU19,0,7,0,0,0
 50 REM SKY
 60 GCOL0,4
 70 MOVE0,500
 80 MOVE0,1023
 90 PLOT85,1280,500
100 PLOT85,1280,1023
110 REM MOUNTAINS
120 GCOL0,0
130 MOVE0,500
140 MOVE380,500
```

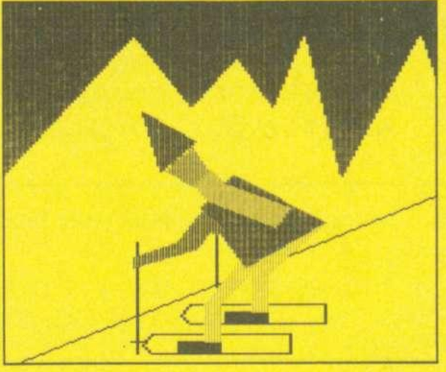
Continued ▶

◀ Continued

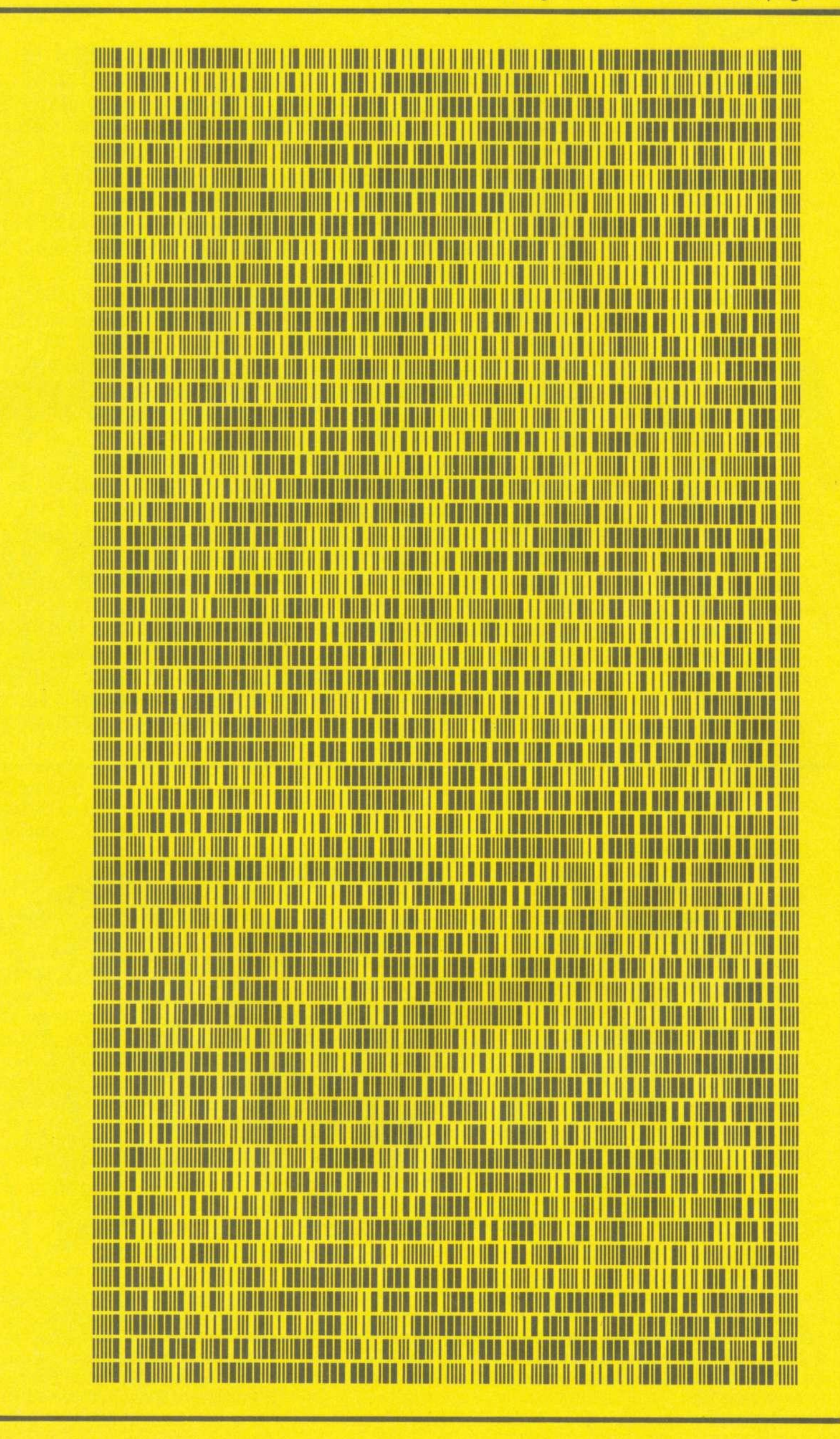
```
150 PLOT85,380,900
160 MOVE700,500
170 PLOT85,380,500
180 MOVE670,480
190 MOVE950,480
200 PLOT85,840,900
210 MOVE660,840
220 MOVE900,500
230 PLOT85,350,500
240 MOVE940,500
250 MOVE1300,500
260 PLOT85,1160,900
270 REM SLOPE
280 MOVE0,0
290 MOVE0,500
300 PLOT85,1280,0
310 PLOT85,1280,500
320 GCOL0,7
330 DRAW0,0
340 REM SKIS
350 GCOL0,7
360 MOVE400,70
370 DRAW430,50
380 DRAW800,50
390 DRAW800,100
400 DRAW430,100
410 DRAW400,70
420 MOVE510,150
430 DRAW530,130
440 DRAW900,130
450 DRAW900,180
460 DRAW530,180
470 DRAW510,150
480 REM FEET
490 MOVE630,160
500 MOVE630,130
510 PLOT85,740,160
520 PLOT85,740,130
530 MOVE500,80
540 MOVE500,50
550 PLOT85,610,80
560 PLOT85,610,50
570 REM STICKS
580 MOVE390,350
590 DRAW390,50
600 MOVE370,80
610 DRAW400,80
620 MOVE600,380
630 DRAW600,180
640 REM LEGS
650 GCOL0,1
660 MOVE700,160
670 MOVE740,160
680 PLOT85,700,260
690 PLOT85,740,260
700 MOVE740,260
710 MOVE700,260
720 PLOT85,900,400
730 PLOT85,830,400
740 MOVE610,80
750 MOVE570,80
760 PLOT85,610,180
770 PLOT85,570,180
780 MOVE610,180
790 MOVE570,180
800 PLOT85,750,320
810 PLOT85,680,320
820 REM BODY
830 GCOL0,4
840 MOVE900,400
850 MOVE680,280
860 PLOT85,650,530
870 PLOT85,560,440
880 REM SCARF
890 GCOL0,2
900 MOVE580,460
910 MOVE550,500
920 PLOT85,620,510
930 PLOT85,590,540
940 MOVE580,460
950 MOVE620,510
960 PLOT85,760,390
970 PLOT85,800,440
980 REM HEAD
990 GCOL0,3
1000 MOVE540,500
1010 MOVE580,540
1020 PLOT85,480,560
1030 PLOT85,540,600
1040 MOVE520,630
1050 PLOT85,560,540
1060 MOVE490,560
1070 MOVE470,540
1080 PLOT85,540,500
1090 REM HAT
1100 GCOL0,6
1110 MOVE450,540
1120 MOVE550,620
1130 PLOT85,400,700
1140 REM ARMS
1150 GCOL0,5
1160 MOVE560,430
1170 MOVE600,400
1180 PLOT85,500,350
1190 PLOT85,550,330
1200 MOVE500,350
1210 MOVE550,330
1220 PLOT85,380,310
1230 PLOT85,380,280
1240 MOVE590,380
1250 MOVE600,370
1260 PLOT85,600,400
1270 PLOT85,620,380
1280 REM BORDER
1290 MOVE0,0
1300 GCOL0,7
1310 DRAW 0,1023
1320 DRAW1279,1023
1330 DRAW 1279,0
1340 DRAW 0,0
1350 DIMP%7,Q%7:!P%=&05040200:P%!4=&0F0
70C05:!Q%=&04010000:Q%!4=&0F0C050A:VDU2,
1,27,1,65,1,8,1,13,1,10
1360 FORX%=0TO1272STEP16:VDU1,27,1,42,1
,5,1,0,1,2:FORY%=0TO1020STEP4:A%=0:B%=0:
FORZ%=0TO8STEP8:C%=POINT(X%+Z%,Y%)MOD8:A
%=A%*16:B%=B%*16:A%=A%+P%?C%:B%=B%+Q%?C%
:NEXT:VDU1,A%,1,B%:NEXT:VDU1,10:NEXT:VDU
1,27,1,50,1,12,3
1370 END
```







Programme 1. Beeb Forum, page 115



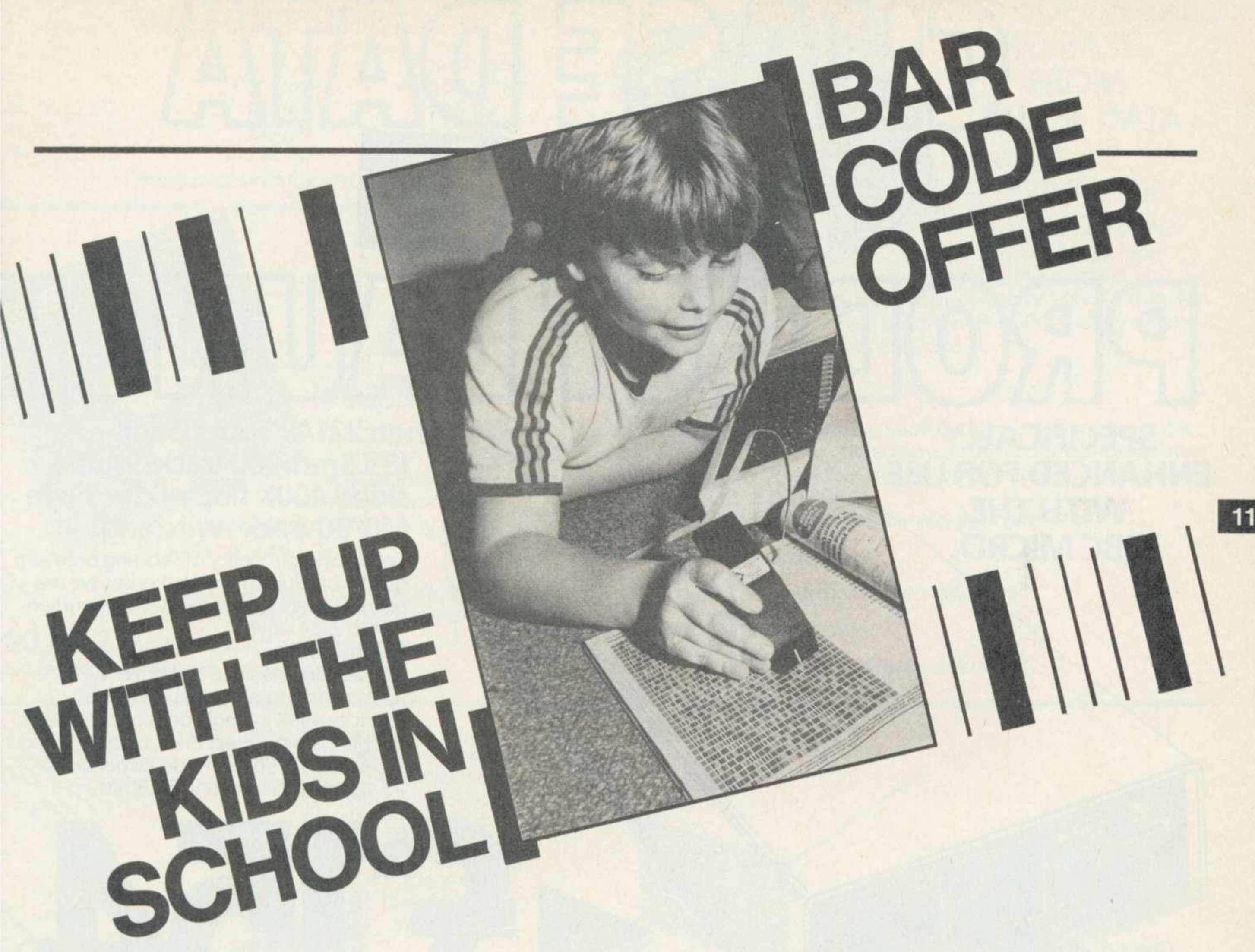
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IF KEYING in all these listings gets you down and your fingers in a tangle why not send off for our monthly listings cassette? It contains all the major programs in this issue and costs £3.75 including postage and packing. You'll find the details about the cassette on page 95 and the order form on page 96.

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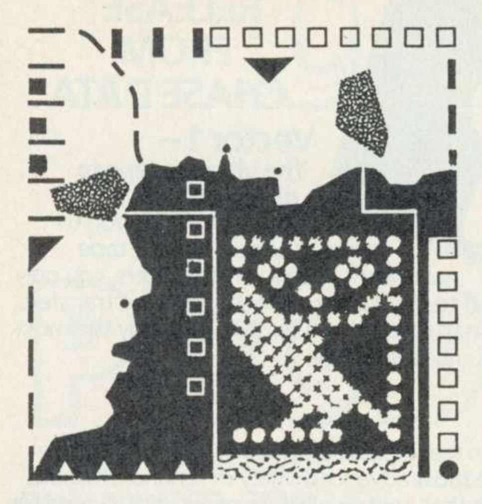
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You answer Bruce Smith's challenge for a program to replace erroneous Is and Os, plus GCOL colour charts and replacing VDU19s with events

£20 I & O challenge is answered

WELL, I was right. I knew someone must have the answer, and Stephen Phelps of Cardiff earns a crisp £20 for his solution to my challenge in December's Beeb Forum. Stephen's program (listing 1, page 105) will substitute all erroneous Is and Os for 1s and 0s.

As it stands, the machine code program assembles nicely into page &A of block zero RAM. This location can be changed by altering the value assigned to P% – remember to edit the last line accordingly though.

The program works using events and as such re-vectors the EVENTV at &220. Each time an event occurs a carriage return is sought. If it's found, the event polling routine assumes a line has been entered into a currently developing program. The program at PAGE is then looked at and any variable assignments sought out. Each of these is examined in turn and any erroneous Is replaced by 1s and Os replaced with 0s.

To ensure that the program and its operation stay protected, the Break key is programmed with the code address and events enabled with *FX14,2.

To test the program enter (save) and run the listing. Now enter a new program or line such as:

```
5 X% = IIOO
```

list the line and what you should see is:

```
5 X% = 1100
```

Apart from utilising the Beeb's events the object code needs some zero page bytes in the user area. It also does not work in immediate mode – any ideas?

£15 Replacement events

EVENTS seem to be the order of the day, and Peter Gregory has come up with an interesting way of using them to replace VDU19s in programs. Peter provides the commentary . . .

One useful trick to produce fast animation is to switch colours round by using a VDU19 command and some time delays. This technique is very fast and means that the calculations and plotting to produce the relevant graphics are isolated from the animation area. However, the computer has to spend all its time doing VDU19s and so can't get on with other jobs.

My solution is a program which switches the colours round automatically by the use of events (listing 2, page 105). To speed up colour switching (and reduce the complexity of the machine code), OSWORD &0C is used instead of VDU19 as event handling routines must take under 10 milliseconds, but is only available for OS 1.2. The program uses the zero page memory to point to each memory block for each colour switching cycle (2 bytes for each block). Each colour block contains the following data:

Block:	LSB of duration of present colour cycle (in centiseconds).
Block + 1:	MSB of duration of present colour cycle (in centiseconds).
Block + 2:	Colours to be altered (n).
Block + 3: to Block + n:	Physical colours of logical colours 1 to n.

The program also uses zero page locations &F8 and &F9 which are not used by OS 1.2 or other ROMs. These areas of memory may be required by future operating systems or various utility ROMs, in which case the assembly language needs to be altered. The routine also looks at location &360 to find how many colours are available. If the machine code is assembled at &F00 onwards, the relevant routines are:

&F01–&F04	Test event type. If not due to an internal timer event, exit.
&F05–&F09	Store A,X,Y registers.
&F0A–&F19	Update colour cycle number.
&F1A–&F23	Get block address from table (&70–&8F) and store at &F8,&F9.
&F24–&F2E	Update internal timer to generate event at end of cycle.
&F2F–&F39	Find out how many colours to be altered. Exit if too large for present mode.
&F3A–&F5C	Switch colours around.
&F4B–&F54	OSWORD call to alter present logical colour.
&F5C–&F64	Set interval timer to generate an event at end of colour cycle.
&F65–&F6B	Restore registers and exit.
&F6C–&F70	Block of memory for OSWORD &0C (VDU19).
&F71–&F75	Block for OSWORD &04 (write to timer). LSW altered by program.
&F76–&F77	Used in colour loop.
&F78	Present cycle number. Updated every event.
&F79	Number of colour cycles. Set by calling program.

To use this program:

- load it into a convenient page of memory, then set up all the cycle blocks in terms of

[Delay Lo] [Delay hi] [Number of colours] [colour 1] [colour 2] . . . . [colour n]

- Set up the zero page pointers to point to the relevant blocks.
- ?[Start of Code + &78] = Number of colour cycles]

This address might be placed between &39F and &3A6 as this range is not used by OS 1.2. To do this, remove line 360 and insert:

```
15 number_of_interrupt_driven_colours = [address]
```

- Set up ?&220 and ?&221 (the event vector) to point to this routine.

Beeb Forum is a platform for ideas, tips and applications relating to the BBC micro and the Electron, intended for experienced programmers to share their thoughts. For every reader's tip published we pay £5 – or more for something special. Contributions should be typed or printed, with substantial listings on cassette. WRITE TO Beeb Forum, Acorn User, Redwood Publishing, London WC2E 9JH.

GCOL 1,n–OR

COLOUR 0

COLOUR 1	Bk	R	G	Y	B	M	C	W	BkW	RC	GM	YB	BY	MG	CR	WBk
Bk	Bk	R	G	Y	B	M	C	W	BkW	RC	GM	YB	BY	MG	CR	WBk
R	R	R	Y	Y	M	M	W	W	RC	RC	YB	YB	MG	MG	WBk	WBk
G	G	Y	G	Y	C	W	C	W	GM	YB	GM	YB	CR	WBk	CR	WBk
Y	Y	Y	Y	Y	W	W	W	W	YB	YB	YB	YB	WBk	WBk	WBk	WBk
B	B	M	C	W	B	M	C	W	BY	MG	CR	WBk	BY	MG	CR	WBk
M	M	M	W	W	M	M	W	W	MG	MG	WBk	WBk	MG	MG	WBk	WBk
C	C	W	C	W	C	W	C	W	CR	WBk	CR	WBk	CR	WBk	CR	WBk
W	W	W	W	W	W	W	W	W	WBk	WBk	WBk	WBk	WBk	WBk	WBk	WBk
BkW	BkW	RC	GM	YB	BY	MG	CR	WBk	WBk	RC	GM	YB	BY	MG	CR	WBk
RC	RC	RC	YB	YB	MG	MG	WBk	WBk	RC	RC	YB	YB	MG	MG	WBk	WBk
GM	GM	YB	GM	YB	CR	WBk	CR	WBk	GM	YB	GM	YB	CR	WBk	CR	WBk
YB	YB	YB	YB	YB	WBk	WBk	WBk	WBk	YB	YB	YB	YB	WBk	WBk	WBk	WBk
BY	BY	MG	CR	WBk	BY	MG	CR	WBk	BY	MG	CR	WBk	BY	MG	CR	WBk
MG	MG	MG	WBk	WBk	MG	MG	WBk	WBk	MG	MG	WBk	WBk	MG	MG	WBk	WBk
CR	CR	WBk	CR	WBk	CR	WBk	CR	WBk	CR	WBk	CR	WBk	CR	WBk	CR	WBk
WBk	WBk	WBk	WBk	WBk	WBk	WBk	WBk	WBk	WBk	WBk	WBk	WBk	WBk	WBk	WBk	WBk

GCOL 2,n–AND

COLOUR 0

COLOUR 1	Bk	R	G	Y	B	M	C	W	BkW	RC	GM	YB	BY	MG	CR	WBk
Bk	Bk	Bk	Bk	Bk	Bk	Bk	Bk	Bk	Bk	Bk	Bk	Bk	Bk	Bk	Bk	Bk
R	Bk	R	Bk	R	Bk	R	Bk	R	Bk	R	Bk	R	Bk	R	Bk	R
G	Bk	Bk	G	G	Bk	Bk	G	G	Bk	Bk	G	G	Bk	Bk	G	G
Y	Bk	R	G	Y	Bk	R	G	Y	Bk	R	G	Y	Bk	R	G	Y
B	Bk	Bk	Bk	Bk	B	B	B	B	Bk	Bk	Bk	Bk	B	B	B	B
M	Bk	R	Bk	R	B	M	B	M	Bk	R	Bk	R	B	M	B	M
C	Bk	Bk	G	G	B	B	C	C	Bk	Bk	G	G	B	B	C	C
W	Bk	R	G	Y	B	M	C	W	Bk	R	G	Y	B	M	C	W
BkW	Bk	Bk	Bk	Bk	Bk	Bk	Bk	Bk	BkW	BkW	BkW	BkW	BkW	BkW	BkW	BkW
RC	Bk	R	Bk	R	Bk	R	Bk	R	BkW	RC	BkW	RC	BkW	RC	BkW	RC
GM	Bk	Bk	G	G	Bk	Bk	G	G	BkW	BkW	GM	GM	BkW	BkW	GM	GM
YB	Bk	R	G	Y	Bk	R	G	Y	BkW	RC	GM	YB	BkW	RC	GM	YB
BY	Bk	Bk	Bk	Bk	B	B	B	B	BkW	BkW	BkW	BkW	BY	BY	BY	BY
MG	Bk	R	Bk	R	B	M	B	M	BkW	RC	BkW	RC	BY	MG	BY	MG
CR	Bk	Bk	G	G	B	B	C	C	BkW	BkW	GM	GM	BY	BY	CR	CR
WBk	Bk	R	G	Y	B	M	C	W	BkW	RC	GM	YB	BY	MG	CR	WBk

GCOL 3,n–EOR

COLOUR 0

COLOUR 1	Bk	R	G	Y	B	M	C	W	BkW	RC	GM	YB	BY	MG	CR	WBk
Bk	Bk	R	G	Y	B	M	C	W	BkW	RC	GM	YB	BY	MG	CR	WBk
R	R	Bk	Y	G	M	B	W	C	RC	BkW	YB	GM	MG	BY	WBk	CR
G	G	Y	Bk	R	C	W	B	M	GM	YB	BkW	RC	CR	WBk	BY	MG
Y	Y	G	R	Bk	W	C	M	B	YB	GM	RC	BkW	WBk	CR	MG	BY
B	B	M	C	W	Bk	R	G	Y	BY	MG	CR	WBk	BkW	RC	GM	YB
M	M	B	W	C	R	Bk	Y	G	MG	BY	WBk	CR	RC	BkW	YB	GM
C	C	W	B	M	G	Y	Bk	R	CR	WBk	BY	MG	GM	YB	BkW	RC
W	W	C	M	B	Y	G	R	Bk	WBk	CR	MG	BY	YB	GM	RC	BkW
BkW	BkW	RC	GM	YB	BY	MG	CR	WBk	Bk	R	G	Y	B	M	C	W
RC	RC	BkW	YB	GM	MG	BY	WBk	CR	R	Bk	Y	G	M	B	W	C
GM	GM	YB	BkW	RC	CR	WBk	BY	MG	G	Y	Bk	R	C	W	B	M
YB	YB	GM	RC	BkW	WBk	CR	MG	BY	Y	G	R	Bk	W	C	M	B
BY	BY	MG	CR	WBk	BkW	RC	GM	YB	B	M	C	W	Bk	R	G	Y
MG	MG	BY	WBk	CR	RC	BkW	YB	GM	M	B	W	C	R	Bk	Y	G
CR	CR	WBk	BY	MG	GM	YB	BkW	RC	C	W	B	M	G	Y	Bk	R
WBk	WBk	CR	MG	BY	YB	GM	RC	BkW	W	C	M	B	Y	G	R	Bk

Key: Bk = black, R = red, G = green, Y = yellow, b = blue, M = magenta, C = cyan, W = white

Alastair Carradice's quick reference chart for GCOL colours

●Enable internal timer events by *FX14,5

●Start the ball rolling by calling the start of the machine code or by CALL-ing OSEVEN (&FFBF) with Y% = 5 to generate an event.

A sample use of this routine is included in the assembly code. To use this, type in the following:

```
MODE2:PROCColours:PROCBLOCK
CALL&FFBF
```

which is not the most useful application of this program, but demonstrates how to use it. The routine only uses all this memory if there are 16 colour cycles. If the number of colour cycles (call this X) is less than X, the vector block uses 2*X bytes of zero page (&F8, &F9). If the background colour (0) is to be altered too, the following two lines need to be changed:

```
200 LDA #&FF
230 LDY marker: DEC colours_to_go:
BPL colour_loop.
```



Quick charts

THE REQUEST for some useful tables has obviously had many of you burning the midnight oil. Most of those received were quick reference charts for GCOL colours using the logical operators, and Alastair Carradice of Seascale gets the vote as his are the clearest.

The tables show the results when a foreground colour, COLOUR1, crosses a background colour, COLOUR0.

SECOND KEYBOARD? IT'S AS EASY AS ADC

Paul Beverley's simple electronics project, using the analogue port, for a programmable second keyboard

CONTINUING my investigation into the potential uses of the analogue port on the BBC micro, this month I'm going to look at the idea of using it to provide a second keyboard. The hardware is simple and straightforward – it's the software that makes the system flexible. There are a number of different ways to implement the system. I'll look in detail at two particular applications and then suggest how you might alter the software to provide a different configuration.

Why use the ADC?

Regular readers may remember that in the July 1983 issue I looked at how the user port could be used to interface to a second keyboard with 16 keys. The keyboard worked automatically by making use of interrupts and could be programmed to produce any set of 16 characters (or control codes) you wanted. So why do we need another design? And why use the ADC (analogue to digital converter) input?

First, the hardware is much simpler – just a single resistor for each key and a variable resistor. No integrated circuits or printed circuit boards are needed, so it's much easier for the beginner to make and it's much cheaper. Second, it only needs four wires to connect it to the computer rather than a 20-way ribbon cable, and the connector used is also somewhat cheaper. The third reason, and perhaps the most powerful, is that it's extremely versatile. You can have as few or as many keys as you like (within reason!). The keys are programmable in that you can make a key produce any character you like, and I'm going to look at a way of automatically re-programming the keys without loading in any extra software – you use some of the keys to select the character set you want.

The hardware

If you look at the hardware (figure 1) you'll see that it bears a remarkable resemblance to the diagram on page 127 of last month's issue. The only addition is a variable resistor which gives it some degree of adjustment. The program to run the second keyboard is entirely in machine code and as it would be extremely difficult to adjust the scaling within the software, we need to use a hardware adjustment.

The basic operation of the hardware was explained in last month's article, so I won't repeat it here. However, apart from the addition of the variable resistor, one other change has been made. The value of the bottom resistor in the divider chain has been increased to give a more reliable selection of the key number by the analogue to digital converter. The best value seems to be about 50 per cent more than the others, as shown in the diagram.

Software – the basic principle

The BBC micro makes extensive use of interrupts to deal with some of its interfacing hardware such as the main keyboard and the ADC. For example, every time the ADC chip finishes converting the voltage on one of its inputs to a binary number, it generates an interrupt. In other words it tells the processor that it is ready to be 'serviced'. The processor then leaves whatever it was doing, reads the number that has been produced, stores it away in an area of memory and sets the ADC to convert the next channel, or if only one channel is being used, to convert it again. When you use ADVAL in Basic, or its OSBYTE call equivalent in machine code, it doesn't actually read the ADC itself. All the processor does is read the latest value from this area of memory and present it to you.

These ADC interrupts are continuing all the time, performing what we call a background task, and so we can make use of them for our second keyboard. We can program the processor so that every time a conversion is completed, it checks the value, and if it's zero (ie no key is pressed) it does nothing, but if the value is not zero, it calculates a number which gives an indication of the key that has been pressed. It then looks up on a table which character that key represents and puts that character automatically into the keyboard buffer.

While this is happening as a background task, the main program, be it a Basic program or a wordprocessor or whatever, discovers that there is another character in the keyboard buffer. However, it has no way of knowing whether it came from the main keyboard or from the second keyboard.

See yellow pages 107 to 108 for the listings needed to run the second keyboard

Two keyboard programs

Programs used to run the second keyboard must be written in machine code since they have to be part of the background operation of the computer. However, you don't need to understand how they work to be able to type them in and use them.

There are two programs in the listings section which could be used with the keyboard. If you're not too familiar with machine code programming, what each of these programs represents is a source code listing – that is, when you run them, they generate the actual machine code program. Once this machine code program (the 'object code') has been generated, it can be stored separately from the source code. So to use the keyboard on subsequent occasions all you have to do is load in the machine code program from disc or tape – you don't need to re-load the source code each time.

The first program just gives a straightforward output of characters contained in a table in memory. Once the machine code program has been loaded in, you could re-program it from within the main program by changing the table of characters that have been loaded into memory. If you wanted to have different sets of characters available, run the source code a number of times with different character set definitions and save each as a separate machine code program with a different name – 'HEXKEYS', 'NUMKEYS', etc.

The second program provides an alternative way of re-programming the keys. It uses the bottom three keys on the keyboard to select one of three different character sets. These are stored in memory and are available for use without any further programming, so the main program running in the computer would be unaware that any re-programming was going on.

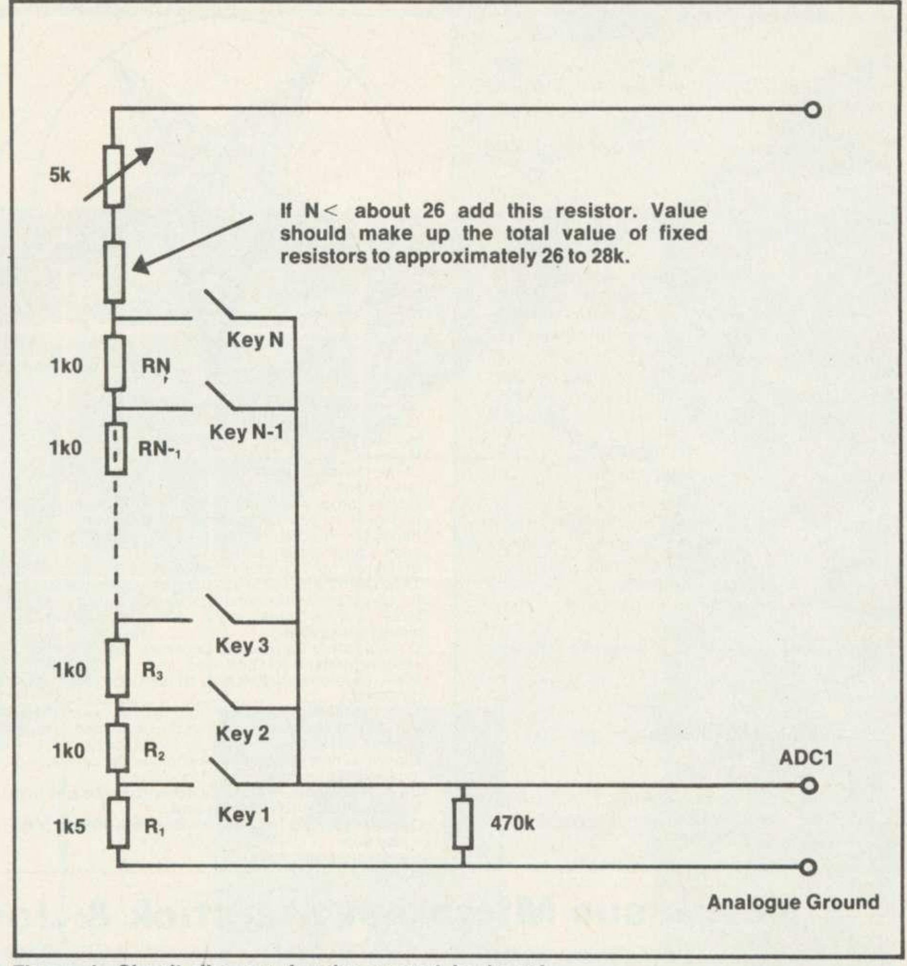


Figure 1. Circuit diagram for the second keyboard.

Setting up the keyboard

The hardware as it stands will allow you to use up to 30 keys. If you're using fewer simply add extra resistance at the top of the divider chain so that the adjustment provided by the variable resistor will allow the top key to give the correct key number. If, for example, you wanted to use 16 keys, you could use a 12k fixed resistor in series next to the 5k variable resistor. With 24 keys you might use 3k3.

A facility for checking this adjustment is provided at the start of the program. For example, if your keyboard has 24 keys you would adjust the variable resistor to find the position where the number produced by key number 24 just stopped giving 24 and began to produce the number 25 instead. Then you would find the position where it just started producing the number 23, and finally move the control to exactly half way between these two positions.

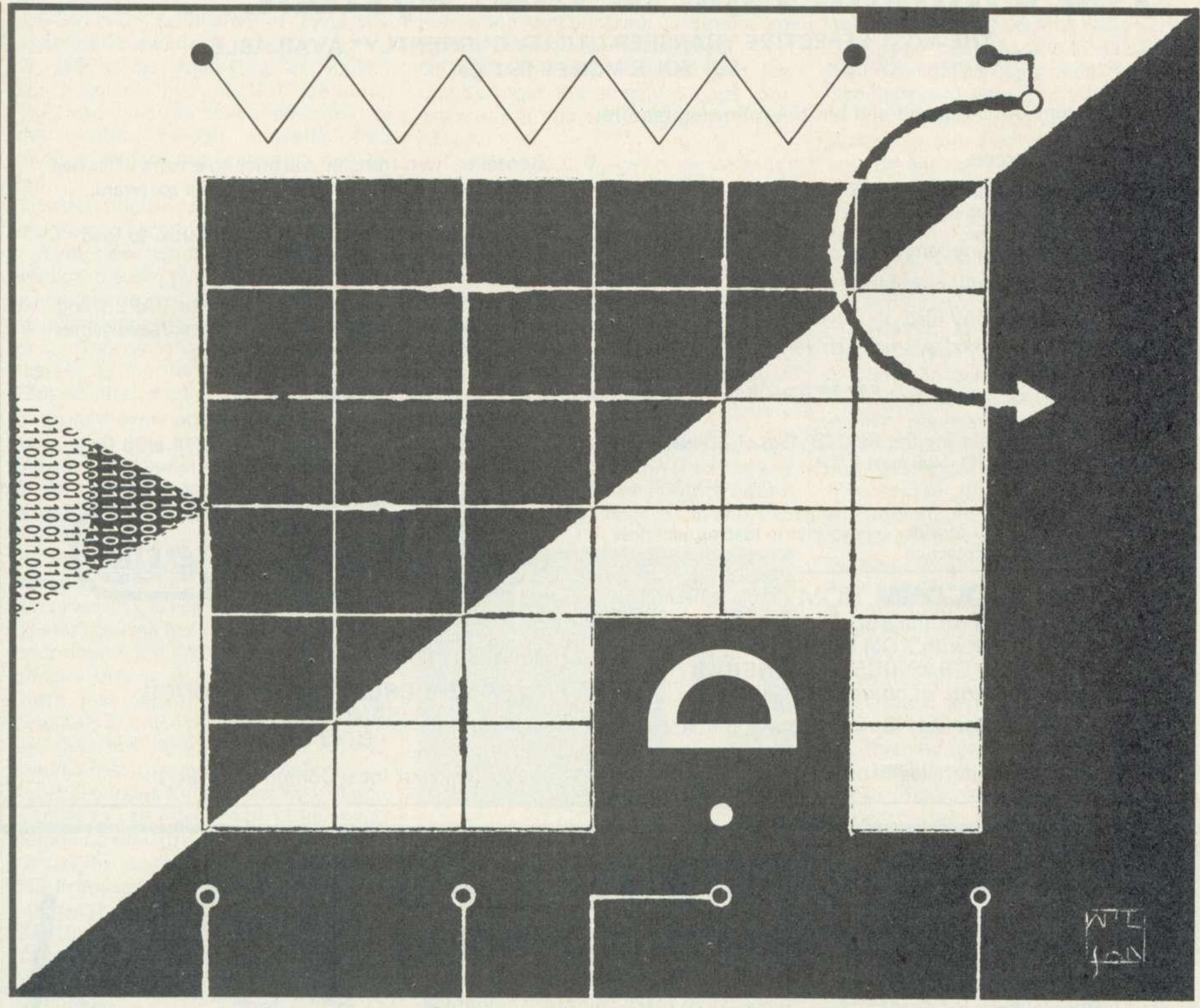
Type in and run the program in listing 1. It will assemble the keyboard software and set up the table of characters which it is to produce. These are selected at line 770 and can be changed to give whichever characters you want. The program also prints onto the screen the command you need to save the machine code program onto tape or disc. Use the cursor and copy keys to enter the command and press the Return key. If you are using tape type *RUN and press Return when you want to use the keyboard again (or */ which is the abbreviation for *RUN) and start the tape. If you have a disc system, it's just as easy. Type *AKEYS where 'AKEYS' is the name you have given to the machine code program (line 90). The system then loads and runs the software. You could of course change the characters at line 770, run the program again, and save the machine code program under a different name.

Once the machine code program has been loaded in, the keyboard can be enabled or disabled at any time using *FX14,3 and *FX13,3 respectively. We can do this because the machine code program does not deal directly with the interrupts but deals with them at the level of what are known as 'events', and these events can be enabled and disabled by using *FX commands. *FX14,3 enables the 'ADC conversion complete' event and it is disabled by the *FX13,3 command.

As it stands, the keyboard is automatically enabled as soon as you load in the machine code program or run the program which assembles it. If you would prefer it only to be made ready for use when you issue the *FX14,3 command, then you simply delete lines 240 to 260 (or lines 290 to 310 on the second program).

Using the programmability

With the particular string used in the listing of the first program, the characters produced by the keys will be the letters a to z plus numbers 0 to 3 to make up the 30 characters. Obviously, if you only have, say, 20 keys then you only need 20 characters in that string, and they can be any of the alphanumeric characters you choose. However, apart from the ordinary characters, you can also get the keys to mimic the functions of the Return, Copy, cursor and Delete keys. To program



keys 1 to 7 to produce these functions use:

```
721 table?1 = 13   : REM RETURN
722 table?2 = &8B  : REM COPY
723 table?3 = &8C  : REM CURSOR LEFT
724 table?4 = &8D  : REM CURSOR RIGHT
725 table?5 = &8E  : REM CURSOR DOWN
726 table?6 = &8F  : REM CURSOR UP
727 table?7 = &7F  : REM DELETE
```

If instead you use any of the numbers &80 to &8A, then pressing the appropriate key will produce whatever is programmed onto the function keys, and this includes *KEY10 which is normally associated with the Break key. If you use code &8A you get whatever has been programmed using *KEY10 except that it does not actually generate the break.

The other useful thing the keys can do is produce control codes. If the keys are programmed as above but with codes 2 and 3 you will have two keys which enable and disable the printer. Codes 8 to 11 would give keys that move the cursor around the screen (without going into the copy mode in Basic), code 12 would clear the screen, code 21 would delete the current line in Basic, and code 30 would home the cursor to the top left-hand corner of the screen.

If you only want to use these programs as they stand then that's all you really need to know, but the whole point about this system is its versatility. There are all sorts of ways you could use it. I haven't got enough space here to give programs for all the ways you could use the system, so I've provided detailed explanations of the two programs to make them easier to adapt to your own requirements. After the detailed analyses there are some suggestions as to how you could expand the system, both in terms of hardware and software.

Analysis of the listings

Lines 50 and 60 give you the opportunity to calibrate the keyboard.

70 sets up the variables used in the assembly.

80 assembles the keyboard program from location &C00 onwards – the area normally used for user-programmed characters. Therefore, you may want to use a different part of memory. If you aren't using a disc system you could assemble at &D01 (but not &D00 as this location is altered when you press Break). If you are using disc but are not going to be using the RS423 serial interface or the cassette interface then you could use &A00. The other option is not to use the pre-programmed function keys and to assemble at &B00.

90 prints out the line used to save the assembled program.

100 calls the routine which sets up the software for immediate use. If you don't want to do this, simply delete this line.

140 disables ADC events since, if you change the program and try to reassemble it while it's still active, it may crash the system.

150 gives a standard two-pass assembly.

190-230 changes the event vector to point to our routine.

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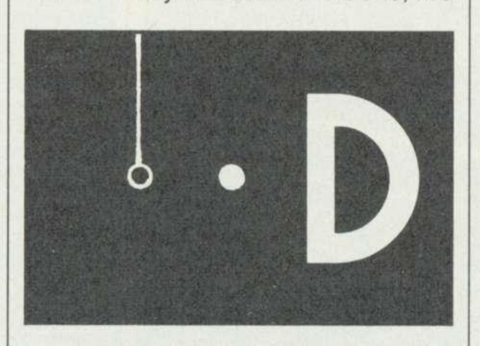
240-260 is the equivalent of *FX14,3 to enable ADC events.
270-290 is the equivalent of *FX16,1 which selects just one ADC channel. This improves the response speed of the system, though it works well enough with all four channels operating.
310-350 initialises variables used in the program to zero.

If you were to put a character into the keyboard buffer every time the ADC did a conversion, you would end up with a string of repeated characters in no time at all. Therefore we introduce a delay (as set by the variable 'delay' at line 780) so that a character is repeated only once every so many conversions. Thus each time a character is put into the keyboard buffer, the value of 'delay' is entered into the variable 'count' which, on successive conversions, is decremented. If 'delay' has a value of 10 then the delay time is 10 centiseconds. You may want to change this delay to suit your particular keyboard.
380-400 checks the value of 'count' and decrements it if it's non-zero, else, 430 checks that it is channel number 1 that's just converted, in case other channels are also being used.
470 gets the high byte of the ADVAL value direct from location &2BA.
480-500 divides the number by 8. If you wanted to use fewer than 15 keys you could add an extra 'LSR A' in here and reduce the value of the series resistor.
510 If the key number is zero, it then resets the variables to zero.
530 Check if the number is different from the last character number.
540 Remember the current character number.
550 If the numbers were not the same, give up. This avoids an erroneous key number being produced if a key is pressed during the course of a conversion. Not until the number is the same twice in succession is it accepted as a valid key number.
570 Save the X value.
580-590 Get the Y'th character from the table of characters.
600 Put character in Y register.
610-630 Put character in keyboard buffer.
640 Restore X value.
650-660 Set the count to avoid fast repeat.
700 The table of characters is put immediately after the program. However, if you want to know where the table is so that you can change the characters directly you could use, say, table=&C80. Then the character for key 1 would be at &C81, character 2 at &C82 etc. If you do, you should change 730 to read P%=&C81+LEN(character$)
710 Poke the character$ into memory.
730 The value of P% is moved up so that when the program is saved, the table of characters is also saved.
860-900 Simply prints out the key number that the machine code program will produce, for setting-up purposes.

The second program is very similar to the first until we get into the assembly language section, so I'll only refer to sections which have been added or modified.

The first main difference is that to select a number of different character tables from a program, two locations in zero page are used to point to the start of the table. An initial value is set up in 250 to 280 to point to the first of the three tables.

The next difference comes at line 620 where we check to see whether the key number is four or more, in which case it is an ordinary character. If it is one, two



or three it transfers this number to the Y-register (650), starts with the offset &60 (660) and adds on Y lots of &20 (680 to 710) and stores the offset at 'table-pointer' (720) before going back through the route of no character having been received (730).

Reading the table (750 to 780) is similar except that the indirect indexed addressing mode is used at line 780. The addresses of the three tables are set up at 900 to 920, and the three character strings poked in at 930 to 950. Setting up the character strings is done in 990 to 1040.

You can change these lines to include function keys, Delete, cursor keys, and control codes.

Compatibility with other software

If you're writing your own programs there's no reason why the keyboard should not be looked at directly. Just use ADVAL (1) (or OSBYTE 128 in machine code) and then deal with the number it returns as you wish.

The keyboard can also be used under interrupt with either of the programs, provided they are assembled in an area of memory not used by your program.

If you want to use the keyboard with wordprocessors such as *Wordwise* or *View* you have to be more careful. First, neither of these programs reserves the zero page locations &70 to &8F for the user's benefit as Basic does. Computer Concepts suggests that locations &30 to &38 should probably be free on *Wordwise*, but Acorn refused to give any details of zero page usage for *View*. For listing 1 the answer is not to use zero page at all. Variables such as 'tempstore', 'last_char' and 'count' could be allocated to some space within the page where the program itself is residing.

However, in the second program, 'table_pointer' must use a pair of locations in zero page. Probably the easiest thing is to use two bytes in the section reserved for Econet (&90 to &9F) – if you want to work on Econet as well, you've got problems!

Wordwise also uses events. When you do something silly like telling it to delete some marked text when you haven't set any markers, it flashes a message at you for a few seconds. This is controlled by setting the interval timer and switching off the message at the end of the time when the timer generates an event. So, as long as you don't make any such mistakes, your keyboard remains enabled. If it does get disabled, go to the menu mode, go into Basic, type in CALL &C00 and then return to *Wordwise* (remembering to press 'Y' when asked if there is any old text!).

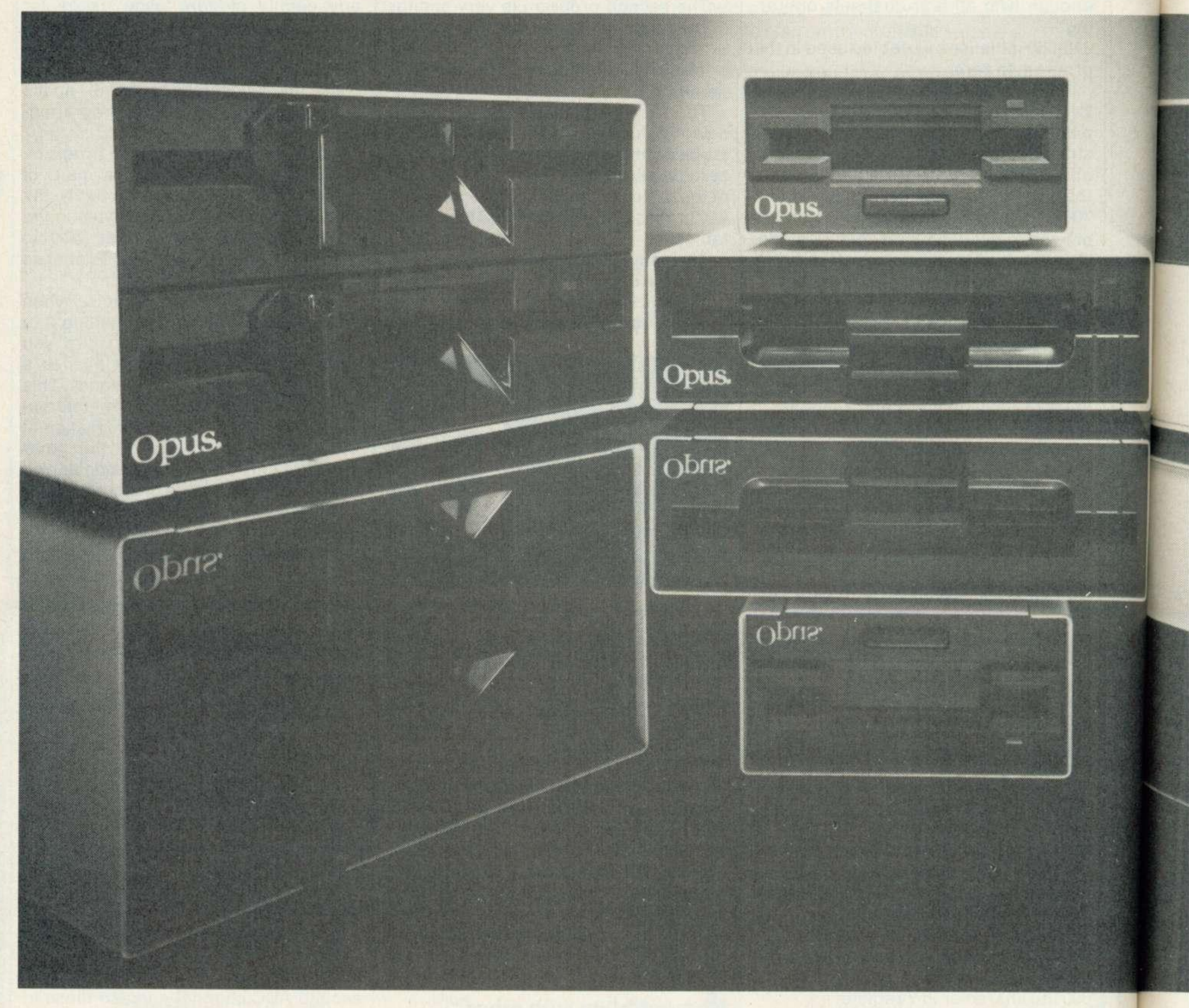
Further expansion of the system

The following possible ways to expand and modify the system are just suggestions – they've not been tried and tested and cannot be guaranteed to work. If you are successful, let us know – your experience might help someone else.

You could use up to 62 keys if you were to remove one of the 'LSR A' commands which each divide the ADVAL value by 2 (line 480, program 1 or line 530, program 2).

It should not be too difficult if you are used to machine code programming to have a couple of switches on the second ADC channel and use these to select a different character table. It could be arranged rather like the Control and Shift keys on the main keyboard so that you have to press 'shift' or 'control' key to get certain functions. And how about mimicking the Quinkey idea? In other words, arrange a set of contacts so that you get a different number according to which combination of five switches is pressed. If you used five switches with 100 ohms, 200 ohms, 400 ohms, 800 ohms and 1600 ohms resistors, then depending on which combination of keys was hit you would get a different value returned by ADVAL.

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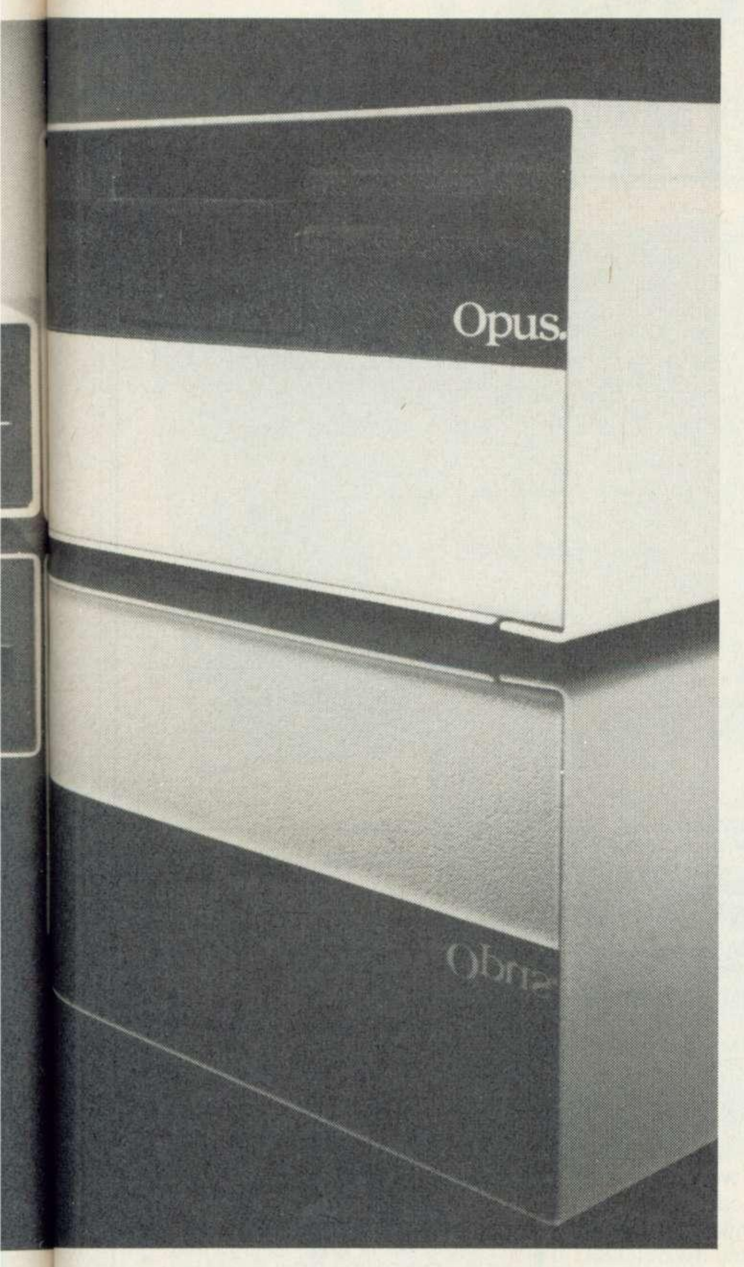
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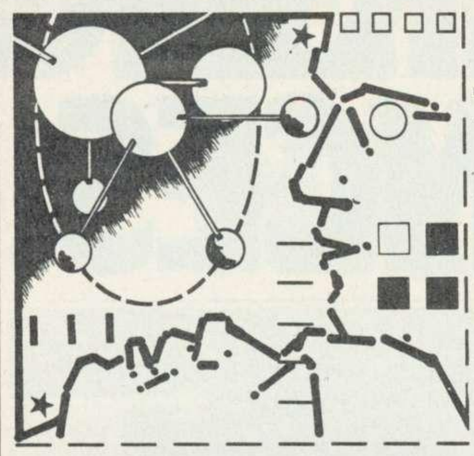
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It's all change on the forum front – our new host, Mike Barwise, tells you what he's got in store. Plus the winners of December's Atom-only competition

Meet your new Atomic host

WELL here it is: the start of a new back-up program for the Atom. As the new host of these pages, my aim is to improve communication between Atom users.

I'll be presenting a varied selection of goodies for you including news, views, answers to technical questions, unusual applications of the Atom, and users' hints and routines. Occasionally I may replace the column with a full article. Published hints and routines will continue to earn the odd fiver or tenner, and we'll make an offer for any article we use.

I hope this new lively column will appeal to you and that you'll inundate me with letters. I'd like to hear from you about your main interest: do you want information for the 12k Atom, or would advice on expanding the machine to its full 64k potential be more useful to you? Your response will help me to host your column in the way you like.

All this, however, depends on you – unless you keep sending in your letters, these pages will disappear in a flash, leaving you with nothing but Atomic waste. So keep it coming!

Quick shuffle

AN INTERESTING couple of routines (listings 1 and 2) to generate true random numbers have been sent in by Andrew Buck of Middlesex. Listing 1 prints the 10 digits 0 to 9 in a random order, runs very quickly and always takes the same time, and listing 2 creates a 52 byte array containing the numbers 0 to 51 in a random order and can be used as the basis of a card-shuffling procedure – it runs in just over one second. These listings illustrate how simple really good programming can be. Andrew also provided a listing off a VAX mainframe, on which these routines are used to process random number sequences at an incredible 100,000 loops in about 50 seconds.

```
 10 DIM A9
 20 REM Initialise Array.
 30 FOR I=0 TO 9
 40 A?I=I
 50 NEXT I
 60 REM Loop to generate random sequence
 70 FOR I=9 TO 1 STEP -1
 80 REM Generate random number less than
    number
 90 REM of remaining choices
100 X=ABS RND% (I+1)
110 REM Print number pointed to by X
120 PRINT A?X
130 REM Copy highest unused number into space
140 REM left by number just output
150 A?X=A?I
160 NEXT I
170 REM Print last number
180 PRINT?A
190 END
```

Listing 1. Andrew Buck's quick random number routine

Disc drive dilemma

OUR first question comes from Anders Reutersward of Solna, Sweden, who has written to ask: Can more than one disc drive be fitted to the Atom under Atom DOS?

The answer is yes. Two drives may be driven from the FDC card in the Disc Pack, using conventional daisy-chained cable.

The commands *DRIVE and *CAT then take the parameters 0 or 1 (without a space before the parameter) to select the required drive.

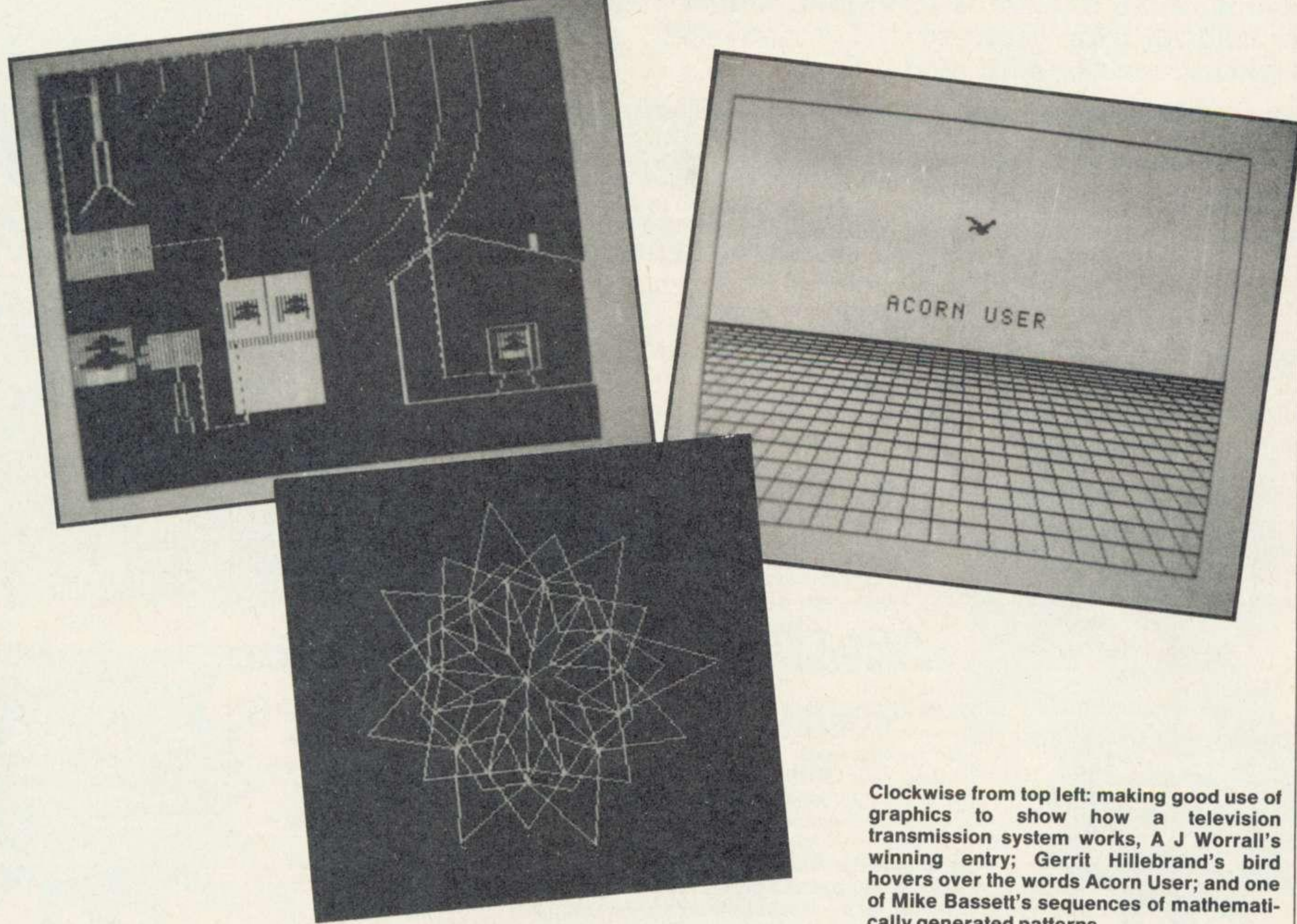
Additionally, the later versions of the Acorn FDC card and the Control Universal FDC card can both support double-sided drives. Careful (very careful!) examination of the card will show whether you have this facility. If pin 1 of the 8271 FDC chip is connected via a buffer chip to pin 32 of the disc connector, you can run four surfaces. If so, the parameters 2 and 3 will select the second side of double-sided drives 0 and 1 respectively.

```
100 DIM A100
200 FOR I=0 TO 51
210 A?I=I
220 NEXT I
300 FOR I=51 TO 1
    STEP -1
310 X=ABS RND% (I+1)
320 B=A?X
330 A?X=A?I
340 A?I=B
350 NEXT I
400 FOR I=0 TO 51
410 PRINT A?I
420 NEXT I
500 END
```

Listing 2. The basis of a card-shuffling procedure – it runs in just over one second

Invented a routine or discovered a hardware modification for the Atom? Here's a chance to show your originality and win some cash. Send your idea to: Atom Forum, Acorn User, Redwood Publishing, 68 Long Acre, London WC2 9JH.

ATOM COMPETITION WINNERS



Clockwise from top left: making good use of graphics to show how a television transmission system works, A J Worrall's winning entry; Gerrit Hillebrand's bird hovers over the words Acorn User; and one of Mike Bassett's sequences of mathematically generated patterns

NOW the moment you've all been waiting for (well at least 10 of you!) – the results of the Atom graphics routine competition set in the December issue.

Surprisingly, only 10 entries were submitted. We had to disqualify two for not sending a tape, so please read the instructions carefully next time. After a long struggle, we reluctantly had to disqualify two more, as we could not get them to load. So that left six contenders.

The entries were marked out of 100 points, with 50 for programming standard, 30 for image interest, and 20 for special qualities such as useful application of graphics, animation, etc. The overall standard was very high, which made judging difficult, but here's the decision we finally reached.

The three prizewinners, in our subjective order of merit were A J Worrall of Bexleyheath, Kent; Gerrit Hillebrand of Hengelo, Netherlands; and Mike Bassett of Chorley, Lancs.

The winning entry certainly made the best practical use of graphics. A J Worrall's entry was a lovely animated schematic of a television transmission system which was very instructional, with nicely handled text windowing.

Gerrit Hillebrand presented a somewhat surreal image of a bird flying over the *Acorn User* name in the background of a perspective field, with neat animation and good attention to detail.

Mike Bassett's entry was a continuous sequence of mathematically generated patterns, interleaved with a menu of the sequence. Nice touches included the highlighting of the next menu item in the sequence, a shaded border to the menu, and the ability to hold a pattern for viewing. The graphic patterns were extremely beautiful, but an attempt at rapid background flashing detracted from the overall effect.

The prizewinners can each choose one of the following prizes:

- The Bearsoft Editor (WP) ROM
- SuperBasic ROM
- *Wolfpack* game

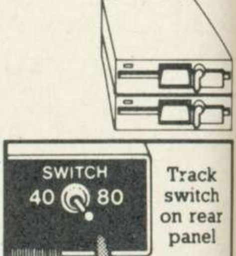
and should write to us, stating which of the three they would like.

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ABC310 running the GEM software

Icon software shown on ABC

ACORN'S version of the Digital Research GEM software was on display at the Which Computer Show running on an ABC310.

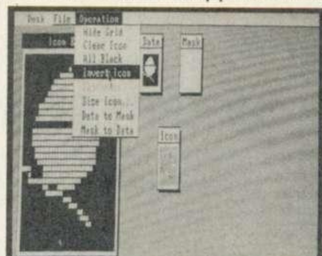
Gem is an operating system which provides icon graphics and windows, as seen on the Apple Macintosh computer, controlled by a desk mouse. Icons are pictures which help people relate computer functions and equipment to office equipment such as waste paper bins and filing cabinets. The mouse manipulates the icons and removes the need to type at a keyboard to control a program.

Gem, short for Graphics Environment Manager, provides a library of programs to set up the icon screen displays which can be accessed by applications packages such as wordprocessors and databases.

The Acorn version of Gem includes Desk Top Manager, through which all operations are performed (*Acorn User* November 1984). The initial pull-down menu offers Desk, File, View and Options.

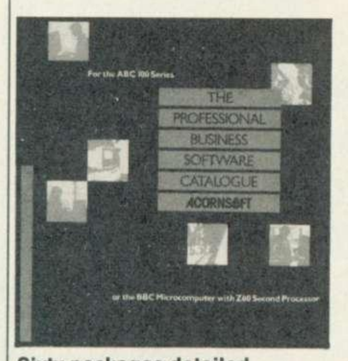
File, as the name suggests, provides a filing system based around 'folders'. View allows information to be juggled around on the screen and Options is a varied collection of utilities.

Gem will be supplied with


Desk Top Manager in action

the ABC310 running the built-in Winchester hard disc and mouse. The system will run less efficiently on the ABC300 but must be bought separately at a price expected to be in excess of £3000. At the time of writing an official release date has still to be finalised but should be imminent as 310s are already in production.

Acornsoft business list out



Sixty packages detailed

ACORNSOFT has released a catalogue detailing more than 60 CP/M software packages configured for Acorn's Z80 second processor and the ABC100 computers.

Wordstar (£400), Supercalc2 (£200) and dBase II (£365) are included in the range, which covers wordprocessing, spreadsheets, databases, accounting, languages and communications. Prices range from £40 (a typing tutor) to £1600 (complete accounting package) – not including VAT.

Acorn has appointed a range of dealers to handle the business side, and prices are set to allow for a generous margin which enables the retailer to give a high level of support. A dealer will make more selling a £400 software package than a BBC micro, and needn't order in bulk.

More details from Acornsoft, Betjeman House, 104 Hills Rd, Cambridge CB2 1LQ. Tel: (0223) 316039.

Expert advice for Graduates

TORCH Graduate users can now run an Expert Systems development package written in Prolog, the language widely used for artificial intelligence software.

Expert system software is built up by providing a set of instructions and guidelines which enable someone who is not experienced in a subject to consult a computer which will help analyse a situation and decide what to do. Hence in certain situations it can replace a human expert, or at least relieve some of his/her workload.

The package is called ESP Advisor and a licence costs £600. Prolog costs £390. Details from Expert Systems International, 9 West Way, Oxford OX2 0JB. Tel: (0865) 242206.

All you need to know

WHAT effect does the weather have on migraine? If that's what you want to know at the touch of a couple of buttons, then take a look at Knowledge Index.

This is an American database containing summaries of more than 20 million books, articles and reports on science, engineering, medicine and computing. Knowledge Index is accessed from a BBC micro with a modem and communications software.

It costs £25 to join for a year and about £20 per hour of searching on the system. Each search only takes a couple of minutes, however. The database can be accessed after 6pm during the week, or from 2pm on Saturdays. The full version, Dialog, runs all the time but is much more expensive.

Knowledge Index is run by Dialog Information Services at PO Box 8, Abingdon, Oxford OX18 6EG. Tel: (0865) 730969.

Video intro to Plan series

MASTER CLASS plans to follow its training video on the Acorn Z80 second processor with tapes covering each of the bundled software packages in detail. These should be available in the summer.

The first tape gives an introduction to the bundled software – File Plan, Graph Plan, Memo Plan, Accountant and Nucleus. It costs £19.95.

Master Class is at 172 Finney Lane, Heald Lane, Cheadle, Cheshire SK8 3PU. Tel: 061-437 0538.

Entry point

TWO business packages have been specially written for the BBC micro with the first-time user in mind.

One covers sales and purchase ledgers, and the other stock control and invoicing. Both are produced by Systematics International at £89 each.

Contact Systematics at Cleves House, Hamlet Rd, Haverhill, Suffolk CB9 8EE. Tel: (0440) 61121.

SAGE - ON BALANCE A WISE BUY?

Francis Pettitt analyses an accounts package aimed at small businesses that includes a second processor

'Sage' integrated accounts program and second processor, Sagesoft, GCC (Cambridge) Ltd, 66 High Street, Sawston, Cambridge CB2 4BG, tel: (0223) 835330/834641, £375 + VAT

DIRECTED towards the small business user, *Sage* performs its procedures according to well-established book-keeping methods and requires both manual logging of certain steps and consultation with accountants to function correctly.

The *Sage* program maintains three files, or ledgers as they are called in its user manual. The sales ledger contains transaction data on company sales; the purchase ledger transactions data on all purchases made by the company; and the nominal ledger holds data relating to things such as company assets (eg, the number of cars it owns), company liabilities (eg, outstanding hire purchase debts on equipment used), director's expense account and so on, in addition to sales and purchase ledger data.

A company's gross profit cannot be worked out merely by taking the total value on the purchase ledger away from the total value on the sales ledger: extra expenses and incomes must be taken into account. These are all noted and stored in the nominal ledger which gives the profit and loss figures of the company.

In addition to maintaining these ledgers *Sage* can also generate aged analyses, monthly and year-to-date accounts and balance sheets.

There is an enhanced version, *Sageplus* (see panel).

The *Sageplus* package has many features to make it completely viable for business use. It should be attractive to a large number of small businesses (and perhaps to not-so-small businesses too, as a desk-top check for the manager's office). The wonderful compactness of the programs – it's possible to store them on one disc – and the fact you are able to keep most data on a second disc, almost creates the illusion that you are using a medium-sized mini-computer with a set of disc-packs!

The *Sage* package will be useful in the education field too. It could be used to present accounting procedures to trainee staff (without taking valuable time away from the mainframe), and colleges and schools could use it on business-type courses, such as those offered by the Business and Technicians Council. In the educational field it's really only suitable for demonstration purposes, partly due to its complexity.

To run the program you need the Sage Z80 second processor (supplied as part of the package), which is derived from the Torch second processor. It comes with the Torch ZDP manual, which is unsatisfactory as it gives fitting instructions largely unrelated to the Sage version.

This second processor system has a number of very undesirable features: the ROM has to be placed to the right of the DFS, otherwise the screen fills with rubbish, and so the Z80 DFS comes up first, without the option of having the normal BBC system running and switching into Sage mode. The Z80 ROM looks first at the disc in drive 0, and if there is no disc the system hangs up until one is inserted, and no combination of breaks overcomes this. If the Z80 processor is not attached continuous 'No Z80' messages are produced. When the *BASIC command is issued the system switches into *TAPE mode. This seems particularly stupid when you *must* have a disc in the system before you can even start! The command (*CPN), given to switch back into Z80 mode from BBC simply does not work – I tried other combinations, and found that *MCP was perhaps the correct command.

To run the 'Accounts' package a double disc drive is required, with the *Sage* program disc in drive 0 and a pre-formatted data disc, used to hold details of all ledger entries, in drive 1.

No disc shuffling is needed, in con-

NEW SAGE PACKAGE

SINCE I wrote this review Sagesoft have withdrawn the product I saw.

The *Sage* package now available is in fact what was the enhanced version, *Sageplus*, and features all the facilities of that product at the same price of £375 plus VAT.

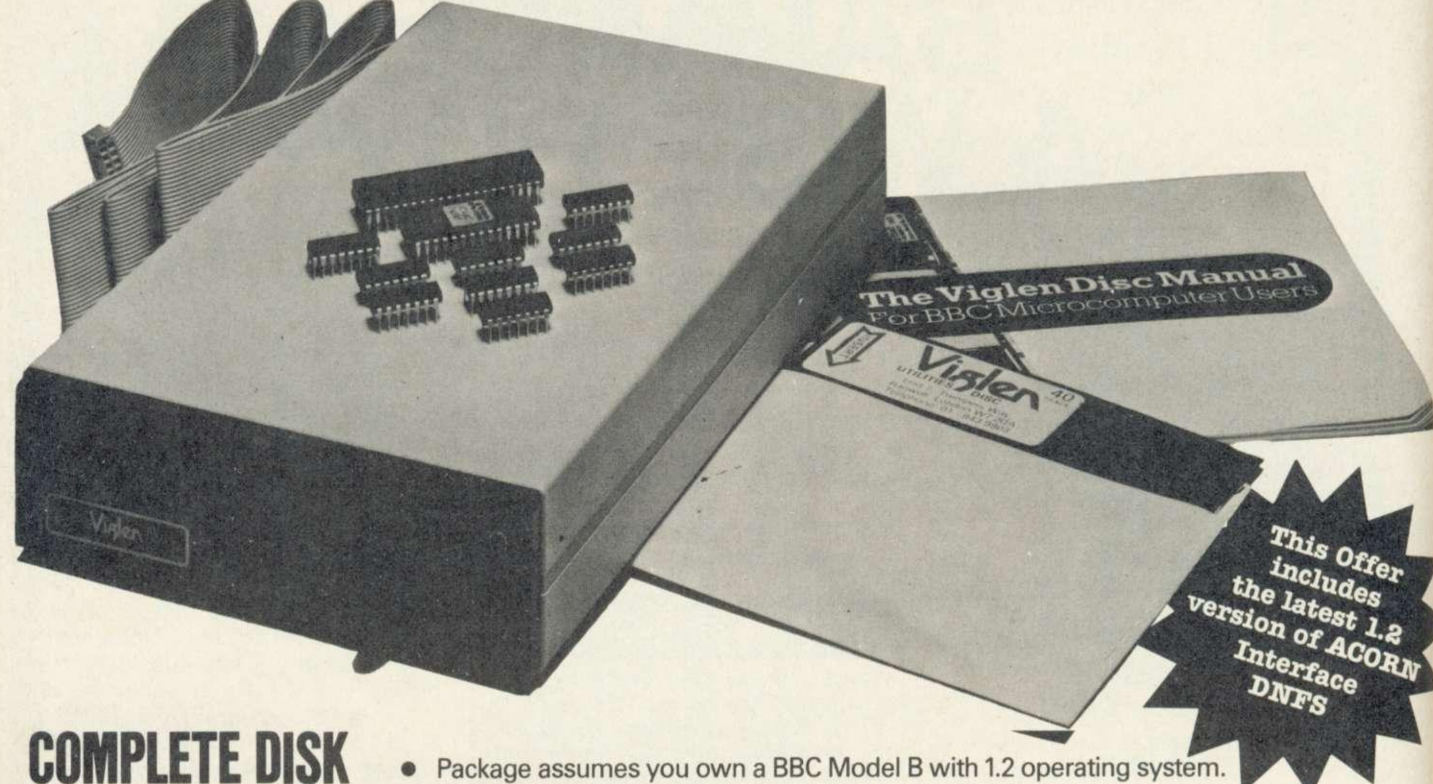
This is a wise move as the old *Sage* package had several major shortcomings which prevented its serious acceptance by the business world. The greatly enhanced features recommend this version of *Sage* to any small-scale business.

To summarise: in addition to all the old features the new *Sage* package has:

- **A greatly expanded data storage capacity which allows up to 9999 sales, purchase and nominal accounts to be entered (10 times more than the Sage system).**
- **The ability to generate sales invoices.**
- **The ability to maintain stocks and sales records.**
- **A credit limit field added to other customer fields in the purchase and sales accounts.**
- **The ability to allocate yearly budget amounts to each of the trading and profit and loss accounts in the nominal ledger.**
- **The facility for budget comparison through the addition of the budget amounts to the accounts and the production of a budget report which displays figures for a single month's trading and the year-to-date situation.**

It utilises two discs, one for the data and the other for the programs, and the method of loading and the hardware used is exactly the same.

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The Sage package includes a Z80 second processor as well as a manual and software

trast to some other business packages designed for microcomputers, where up to 10 discs may have to be interchanged during one data-processing session. This integration of programs onto one disc is an excellent feature of *Sage*.

Although *Sage* specifies that only one data disc is required, this is not strictly true, because the number of transactions which may be effected is unlimited, and so the amount of stored data may overflow onto another disc. Furthermore, since the 'Accounts' program contains a section that enables the user to maintain a customer address list, *Sage* suggests that a separate data disc is kept of all customer details, and you replace the program disc with this to run this part of the program. (It is possible to store the customer details on either the program or the data disc, but this restricts the disc space available for ledger items.)

The demonstration routine at the end of the manual is useful for trying out the various features and options offered by the system. First, the main menu with 17 options appeared on the screen. I chose option one: allocate purchase accounts. *Sage* includes three fields here: account number, existing account name and new account name. Purchase ledger accounts are entered in the same way. The key field is, of course, the account number. Since the only way of ordering the accounts is by numerical ascending order of this field, users are advised to leave sufficient numbers free between each letter of the alphabet for extra entries to preserve alphabetical order when a printout of the accounts is needed. I would have preferred a choice of key fields giving a variety of item sorts, so that, for example, a list of unused account numbers could have been provided and a strict control of number allocation for accounts avoided.

Information retrieval

This relative inflexibility of information retrieval from the files securely labels *Sage* as a conservative file-oriented system using traditional book-keeping procedures. While realising that a semi-database approach would probably reduce the amount of data able to be held on two discs, I would have preferred an extra program disc, and a consequently greater flexibility in the format of information retrieval from the system.

Perhaps Sagesoft realise this and may either expand information retrieval facilities in their later versions (I was using version 3 Jan 84) or provide a separate disc with extra features. What must be emphasised is that *Sage* is essentially a data-processing system, allowing the input of data and its processing into information according to well-defined, programmable functions, rather than an information-processing system to aid in the clarification of managerial decisions, and which involves less directly programmable functions. Perhaps the next generation of micro software will be able to miniaturise the operation of total databases to such an extent that it is possible to achieve true mini-computer facilities on a micro. Already, with *Sage* we see features normally found on larger computer systems, and this is obviously a good sign.

The most significant of these facilities is the setting up of nominal and general ledgers. There are three parts: the trading account; the profit and loss (P & L) account; and the balance sheet. The accounts must have numbers allocated to them in a specific ordered system laid down in the manual. Four numbers are already reserved by the system for specific accounts (eg, 38 is allocated to debtor's control account). Obviously, with the opening of nominal ledgers, the amounts entered against each account depend on involved accounting procedures and structures which must be agreed beforehand. The system offers no assistance on these matters which must be worked out with accountants and auditors.

The accounts are able to be collected into categories, thus making monthly accounts rather more readable. For instance, categories could include all those accounts referring to sales, all those referring to opening stock, etc. Up to 15 categories can be defined for the trading account and this should be sufficient for most purposes of analysis. The allocation of categories to specific accounts (by stating the ranges of account numbers) is easily effected through option four (amend layout of accounts) of the 'create ledgers menu'.

The profit and loss account is organised in a similar way to the trading account except that, of course,

the details refer to overhead costs and indirect sales expenses. Here, up to 45 categories can be created so that the accounts may be structured according to their order, or number allocation, as in the trading accounts section of the nominal ledger.

The balance sheet consists of four sections: 'fixed assets', 'current assets', 'current liabilities' and 'financed by'. Here again, categories, and accounts ranges within them, are suggested by the user but are not accorded an obligatory coding system. After the system has been set up and all sales, purchase and nominal accounts have been entered, it allows opening balances to be entered.

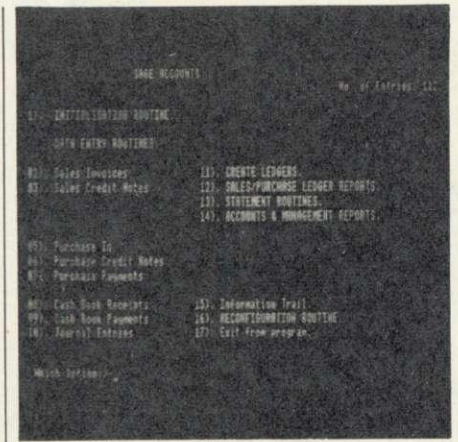
In both purchase and sales ledgers the following fields are considered: account code; date (of invoice); nominal account code (this is the account number, entered to identify the particular nominal account which will be affected by the sale or purchase ledger transaction); details (in this case, 'opening balance'); nett (the gross amount of the invoice); the VAT code (at the start this will be '0') and the VAT itself (which will be zero at the opening of the account).

It's easy to enter the opening balance in the sales and purchases ledgers. With the nominal accounts, however, an accountant's advice is essential in order to arrive at credible figures for the various sections. Once these have been reached the ledger may easily be filled. A nice feature of this part of the program is the automatic entry of the account name once the (correct) account number has been entered.

When the accounts have been set up and initialised the *Sage* system allows for normal monthly sales/purchase ledger routines to take place. The computerised system is not a substitute for manual procedures in checking or validating data to be entered. Batch control sheets must be used if the system is to achieve proper control of accuracy. This may come as a slight shock to those potential users hoping to throw away their pens and forms but *Sage* does not provide an alternative to these manual clerical procedures.

Once manual procedures have been completed data may be entered into the various ledgers. Invoices, credit notes and cash receipts may be entered in the sales ledgers. Fields involved are: account number, date, invoice number, nominal account number, details, nett amount on invoice, VAT code and VAT amount. All these fields are well-backed up by validation checks, eg, the date will be thrown out if not entered in the correct format (ie, 150384 for 15th March 84).

If an invalid nominal account number is entered this, too, will be rejected by the system. For example, if an article has been sold to the account number holder 094, the nominal account code must be 101 if it is to be within the range set for sales in the trading account section. It would have been nice if the user didn't have to remember the nominal account number every time. Obviously, each user will have a table of nominal account codes before him or her while using the system, but a more sophisticated approach, whereby appropriate codes are shown on the screen as mnemonics would be an improvement. In some cases these nominal account codes could have been filled in by the program through a validation routine.



Sage's main menu has 17 options

One of the beauties of the *Sage* system ledger is that any entry in the purchase or sales ledger will automatically update an entry in the nominal ledger. This is the most significant feature of the package and one I consider highly desirable by the majority of prospective users.

Report handling

The report-handling features of *Sage* are what you would expect from a file-oriented system. These features are all useful and the printed format of information is well-ordered and readable. The report consists of nine categories: sales invoices, sales credit notes, sales receipts, purchase invoices, purchase credit notes, purchase payments, cash-book receipts, cash-book payments and journal entries. Each category is accessible through option 12 of the main menu, and option six of the sales/purchase ledger reports. The user can narrow down the type of report information required by specifying the period and code of transactions.

In several report formats only printer options are available, and this lack of screen display options means you waste a lot of paper if you ask for information that only requires a soft copy.

Unfortunately, the system makes no distinction between payment by cash and payment by cheque, which is crucial to most accounting sections, and discounts received or allowed are not shown on any of the ledger accounts.

At some stage the data disc becomes almost full. Fortunately, the menu shows the number of entries, so if you have calculated how many transactions you're able to store on the disc you will not be in danger of losing any details. A simple reconfiguration routine (a warning will be issued on the screen stating when this routine is needed to be run) will erase all paid invoices, payments and associated nominal ledger entries. It's obviously a good plan to have a well-defined back-up routine, not merely for the program disc but also for the data disc.

The *Sage* system, with its emphasis on manual batch control sheets and regular back-up routine, encourages the setting up of procedures which are common practice in the computerised data-processing departments of any medium-to-large company. I would also advocate use of the generation system of file security for *Sage*. It is a pity, on the security front, that no particular access rights are specified for users. This package is definitely for the one-man band whose only check against unauthorised entry to his data is a secure lock on the office door. This inconvenience can only be avoided by using number and directory facilities available on networks.

I found the editing routines to correct entry mistakes easy to use and sufficiently flexible to cover most cases. It was essential for me to keep an accurate manual log-book indicating all my account code allocations and categories close at hand for frequent consultation, in addition to listings of all types of account details. I would have appreciated it if the *Sage* package could have done more of this logging for me. In particular, a structure chart showing all the relationships between my various types of accounts and their categories would be useful.

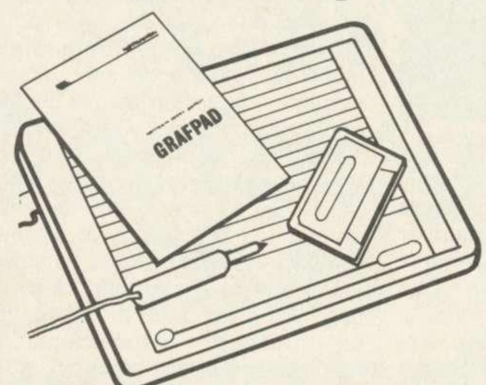
With the proviso that *Sage* makes no attempt to provide a brilliant display of database oriented information retrieval services, but is the computerisation and sophistication of well established manual clerical programmable procedures, it can provide an invaluable tool for the small business.

People must choose for themselves between a dual disc business software system that involves expenditure on a second processor and an internal ROM, or a multi-disc business software system that does not. The prospective buyer/user must weigh up the relative importance of cost and convenience to his business and make his or her decision on that basis.

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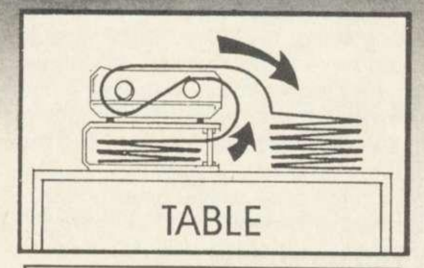
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INDEX AUGUST 1983 TO JULY 1984

HERE's part two of our cumulative indexes for *Acorn User* numbers 13 to 24 (August 1983 to July 1984), compiled by Paul Nash.

There are separate indexes for authors of reviews, book reviews, hardware/firmware reviews and software reviews. Last month we covered articles without programs, articles with program listings, and authors of articles.

You'll find indexes for our first 12 issues in the December 1983 issue.

Each index entry refers to the *issue number (in italics)*, then the page number at which the item begins.

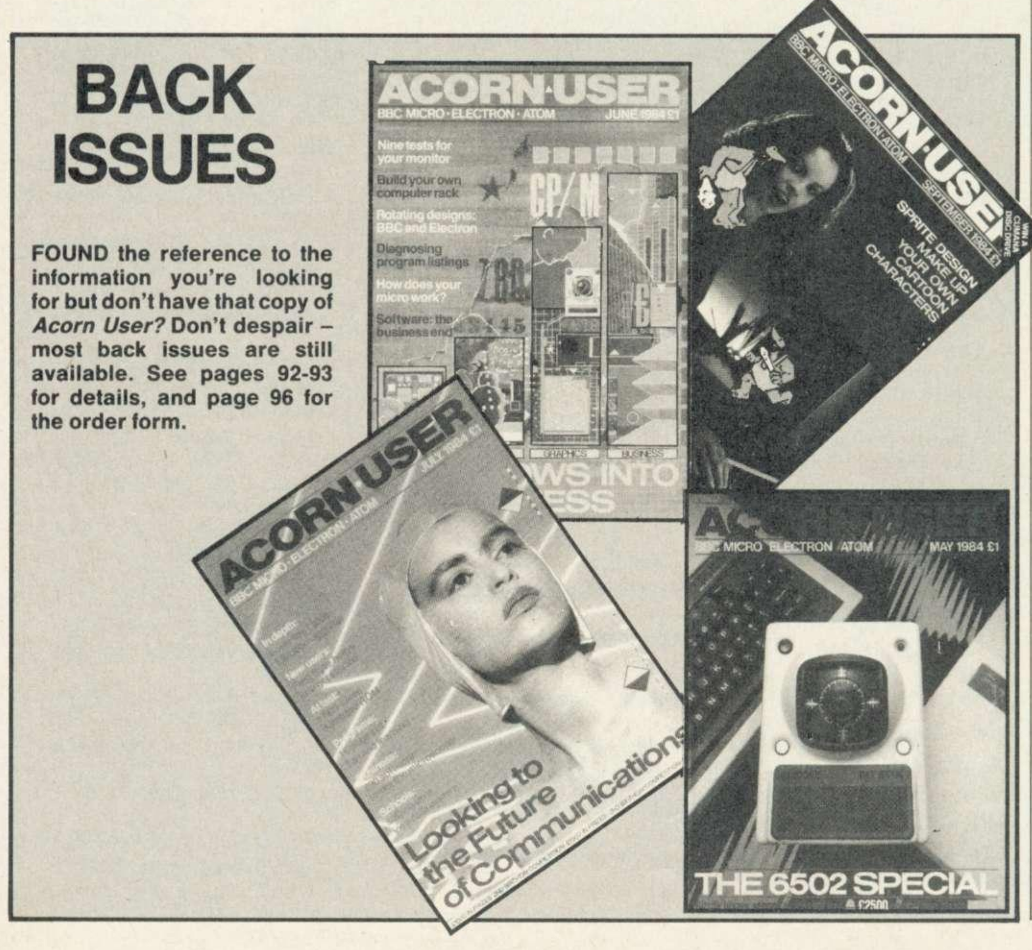
If you find what you're looking for, but don't have that issue, turn to pages 92-93 for details of how to obtain back issues of *Acorn User*.

AUTHORS OF REVIEWS

SOFTWARE REVIEWS

HARDWARE/FIRMWARE REVIEWS

BOOK REVIEWS

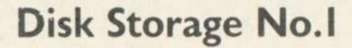


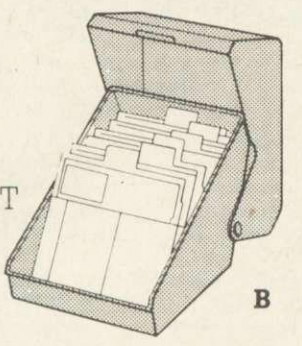
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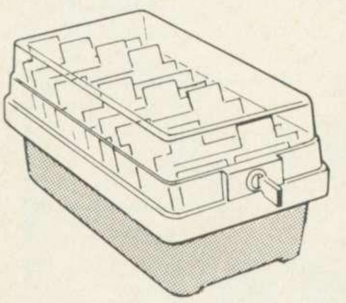
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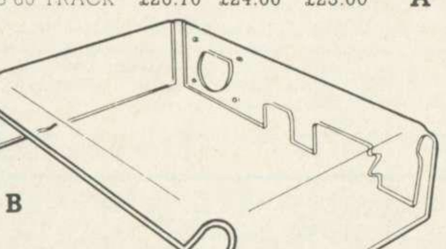
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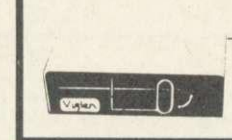
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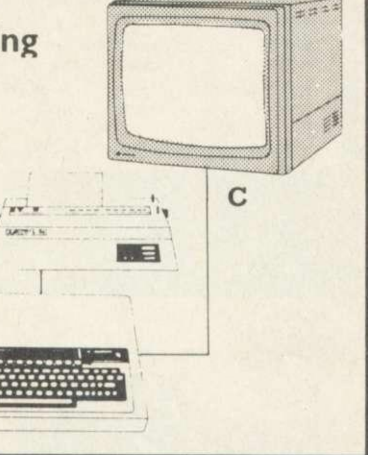
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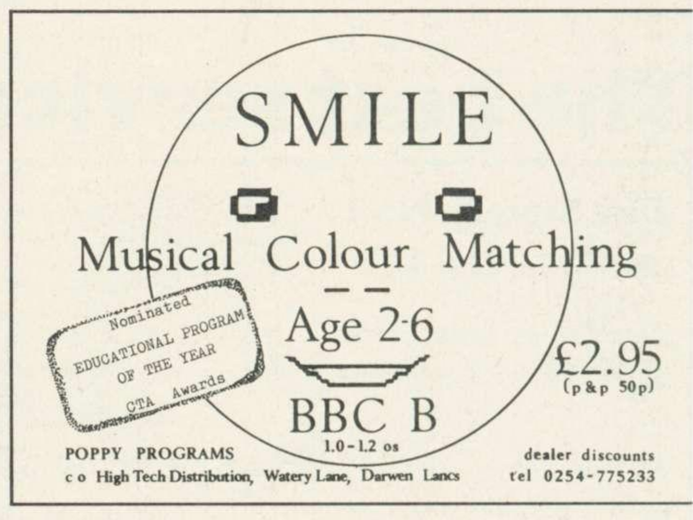
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Electron software plea

'WHAT educational software is available for the Electron?' is a question I received from Miss D Hillage of Cornwall Software and have often heard elsewhere.

She suggests that a list of items compatible with the Electron or specifically designed for it would be a good idea, and adds, 'I am surprised that the software market has not made its customers more aware of compatability with the Electron. They are surely not holding back for fear of the dreaded piracy since this information is



Electron – lacking educational software?

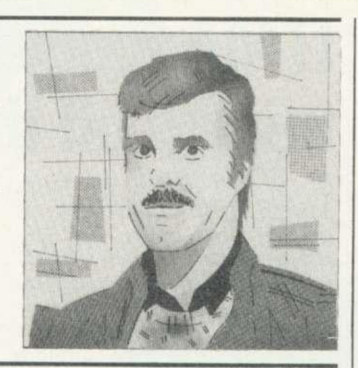
likely to lead to increased sales of the suitable titles.'

So, if anyone has compiled such a list – not just of Electron educational software, but also any for the Beeb which will run on its cousin – please drop us a line.

On guard

THE BRAINWAVE Break key guard is two pieces of mild steel, designed to stick onto the keyboard assembly and poke through the case, covering the Break key so that it may not be hit accidentally. A hole in the top of the guard enables the key to be pressed deliberately with a pencil. Like all good ideas this one is simple, effective and cheap at £2.50. Contact Brainwave at 3 Lynwode Road, Cambridge CB1 2HL. Tel: (0223) 323351.

Commentary by Nick Evans, who welcomes reader feedback



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IF YOU have any programs or applications for the BBC micro in metallurgy and materials science, I W Clyne of the University of Surrey, Guildford GU2 5XH, tel: (0483) 571281, is waiting to hear from you.

He wrote to us giving details of a conference the University was holding on the BBC micro and materials science which arrived too late for publication – if you want to publicise such an event remember we're working three months in advance of publication.

He also made a suggestion (one that had already been discussed at *Acorn User*) that universities, colleges and schools should be encouraged to exchange their ideas and programs through our free ad pages.

So if you're interested in taking up this offer, send your ad to the usual address, and include a letter confirming that the materials offered are for exchange and are public domain (ie, no copyright applies to them, either from the establishment involved or from an author). We'll set up a special section for such ads if there's enough demand.

Tidy ROM expansion

AS schools purchase more ROMs to go into the sideways sockets, so there develops a problem with space. Where do you put the extra ROMs when all the holes are filled? Answer – an expansion board. Many schools have merrily bought these and loaded up with extra chips, only to find a few new problems arising.

First, some *-commands are common to more than one ROM so whichever is the nearest ROM in priority executes the command. If that doesn't happen to be the one you want then it's necessary to deselect the appropriate ROMs so that the chosen one will operate – messy!

Second, the problem of over-heating, caused by the extra power necessary to run these chips – not only in the main supply but also in the chips themselves. For example, it's possible to lose entirely your disc filing system so that no Acorn DFS message appears on the screen even on Break. A pretty pickle if you happen to have a machine full of data waiting to be filed.

Ways of avoiding these problems are numerous. Two of the better ones involve either incorporating a fan into the lid of the machine – or even drilling a few strategic air holes – but this doesn't look very pretty. The alternative is to buy an external expansion board, such as the one manufactured by Micro-Pulse at £49.95. With this you can have the ROMs outside the machine – up to eight at a time – and, an added advantage, the ROMs may be manually switched into operation with an indicator showing which is in use at any time, saving the constant need for *FX selection and de-selection commands.

The board comes complete with connecting cable and instructions. Micro-Pulse are on 0928 35110.

New computer breakaway

AN INTERESTING side-line on the school holiday, trip away or summer camp is the Beaumont Computer Camp.

The camps are structured on half-day sessions – computer awareness and use including Logo, robotics, micro-electronics, languages and word processing take up half the day, with the rest of the time being given over to sailing, canoeing, horseriding, pottery, art, shooting, archery, judo and many other lively activities.

One free place is offered with every group of ten children, and there are 13 sites to choose from around the country. A free video introduced by Chris Searle is available to demonstrate the attractions of the centres.

For more details, contact Beaumont Computer Camps, FREEPOST, Huntingdon, Cambs PE18 8BR. Tel: (0480) 56123.



Robotics are one of the subjects covered at Beaumont Computer Camps

Special pack

SPECIAL schools, mostly ESN (M), are going to receive the controversially priced *Microspecial* pack produced by the Scottish Microelectronics Development Programme.

Originally to be marketed at £250, it met with such an outcry that the DES has bought up the bulk from the publishers Hill McGibbon. Other areas to receive the package are special education centres and MEP information centres.

Wordwise confusion 'regrettable'

WORDPROCESSING fanatics using *Wordwise* from Computer Concepts were pleased to see mentioned in an article in the *Times Educational Supplement* last summer the new Aries up-grade for the chip which included several improvements to the original format.

Imagine their surprise when, having forked out some £8 for the up-grade, they saw another article in the *TES* followed by an advertisement in *AU* for the *Wordwise-Plus*, which combines the usual features with others including mail-merge facilities, index generation, and two column text printout which they had not been informed about when they bought the Aries.

When they contacted Computer Concepts to point out that they had just paid out for the Aries, they were told that it was regrettable but that they weren't going to do anything about it – the full £17 plus VAT upgrade still had to be paid for the new chip.

This has happened to several schools to my knowledge and must be magnified throughout the country. One wonders whether Computer Concepts read letters (address: Gaddesden Place, Hemel Hempstead, Herts HP2 6EX. Tel: (0442) 63933), and whether they take notice of irate *AU* readers who have been led up the garden path.

MEP project needs help

A NEW, wide-ranging course devoted to the full spectrum of micro-electronics and its applications is planned by the South Yorkshire and Humberside area MEP. A survey is currently taking place of all the initiatives and projects undertaken by schools and authorities, and any successful teaching packages devised as part of the MEP.

If you've not been approached yet and feel you have something to offer, please contact the Project Director, MEP Regional Centre, Exeter Road, Coventry Grove, Doncaster DN2 4PY.

ITMA modules help get micros off the shelf

GOOD news from Sir Keith Joseph (a rare event!). A couple of months ago he stated that provision for INSET (In Service Training) was to be increased in 1985-86 by over £10 million to £17½ million. So let's hope some of that funding can be channelled into training people how to use the micro in the classroom.

Teachers must be taught its applications, its strengths and weaknesses, and then encouraged to buy software – something many primary schools lack.

Although many teachers attended the original induction course on how the micro works when a school bought its first DoI package, the computer has often been left on the shelf largely because of this lack of expertise and software.

One possible help in this direction is the set of programs from the ITMA (Investigations on Teaching with Micros as an Aid) collaboration in Plymouth. 'Micros in the Primary Classroom' is a set of five modules each dealing with different aspects of using computers in teaching. It comprises a good deal of documentation and a lot of very useful programs, designed to be not only utilitarian but also to demonstrate certain fundamental principles of computing in education.



Sir Keith Joseph: good news



The 'Micros in the Primary Classroom' modules help to make good use of computers

ITMA has been responsible to a great extent for people thinking about the philosophy behind micros in the classroom, and their well thought-out and documented programs are tangible evidence of these carefully constructed principles. The five modules are the classroom, the micro and you; the curriculum and the micro; on managing the micro; building in your ideas; and going-on learning.

The series is published through Longman and costs £20 per module – a small investment if one considers the price in relation to INSET costs. It may be possible for you to borrow, or at least view, the suite at your local viewing centre or regional MEP centre.

CLASS-room newsdesk aids literacy

SPECIALISING in programs for developing reading, writing and general literacy skills, CLASS (Cambridge Language Arts Software Services) is a new company, distributing through the National Audio-Visual Aids Library.

They have several original programs available including *Add-verse*, for creating and storing pages of animated or still shape poems; *Class writer*, an electronic book program; *Space Programme Alpha*, a simulation in which the class members are part of a space project; and *Space Rescue*, an introduction to some aspects of modern micro-technology.

An intriguing idea is *Newsdesk* – a simulation in which the user is a sub-editor in a newspaper office. Newsflashes come in on the teleprinter and background information is found in a variety of forms, and simple word-processing skills are involved.

All these programs are available from NAVAL, 16 Paxton Place, Gipsy Road, London SE27 9SR. Other enquiries to CLASS, 93 Bedwardine Road, London SE19.

SCI-QUIZ WINNERS

WE CERTAINLY set you thinking with our Sci-Quiz in the December issue: only nine entries were worthy of prizes and two of these got one question wrong.

The answers were 1. Mosquito; 2. Bassnotes; 3. 7; 4. Robots; 5. V = fx (velocity = frequency × wavelength); 6. Carnivores; 7. Polyvinyl chloride; 8. Manned manoeuvring unit; 9. Lithium (or Potassium); 10. 4,500 million.

First prize of five software packs – *Waves, Relationships, Bonding, Electronics* and *Electromagnetic Spectrum* to accompany the BBC TV *Science Topics* programme – goes to Arthur Brugman of Voorburg, Holland; second prize of two packs goes to Angus MacLeod of Sir E Scott School, Isle of Harris; and third prizes of one pack go to Shoua Morrison, Roderick MacPherson and Grant Fulton, all also of Sir E Scott School; LHT Griffith of Rainham Mark Grammar School, Kent; Adrian Tivey of Park High School, Middlesex; Brian Ridd of West Buckland School, Devon; and Susan Isherwood of Wirral County Grammar School, Wirral.

AMX ART

AMX MOUSE

The AMX MOUSE is an advanced opto-mechanical device which brings to the B.B.C. micro facilities hitherto only available on more expensive machines. It enables you to use advanced features such as ICONS, WINDOWS, and POINTERS in your own programs.

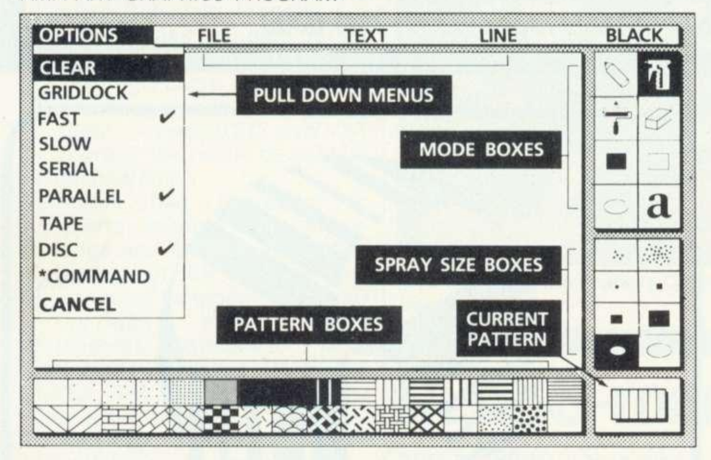
The AMX MOUSE can be used with ordinary programs to replace the cursor keys and with the AMX software it turns the B.B.C. micro into a far more user-friendly device, enabling beginners to quickly learn to use the computer for a wide range of purposes, including COMPUTER AIDED DESIGN, Word Processing, and a host of business uses – to say nothing of its inclusion in games software.

A further range of software will be released in 1985. Starting with "DESK TOP MANAGER".

THE AMX MOUSE PACKAGE

The AMX MOUSE – an advanced three buttoned mouse which simply plugs into the B.B.C. user port drawing its power from the computer.

AMX ART GRAPHICS PROGRAM



The AMX ROM – contains fast machine code routines for creating on screen windows, icons, and pointers and enables to MOUSE buttons to be programmed for use with commerial software such as Wordwise and VIEW.

Please send No________ **AMX MOUSE** package/s (including **AMX ART** and EPROM) at **£89.95** inc. VAT and P&P.
I enclose a cheque/PO for £_________ or debit my credit card.
Card No. ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐ ☐ Visa ☐ Access
Name ________________________
Address ________________________
Signature ____________ Date ________
(Please tick choice of media for AMX ART) ☐ Cassette ☐ 3" Disc ☐ 5¼" Disc
To: Advanced Memory Systems Ltd., Woodside Technology Centre, Green Lane, Appleton, Warrington, WA4 5NG, England.

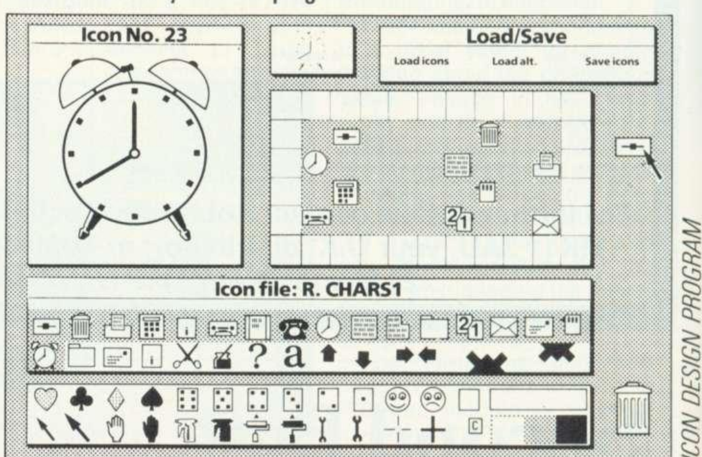
If not available from one of our main dealers, fill in the coupon and we will send you an AMX MOUSE with AMX ART with our full no quibble money back guarantee. OR phone 0925 602690/62907 for instant Access or Visa orders.

A MANUAL describes how to operate the MOUSE and the ROM routines which are available in both basic and machine code programs.

AMX ART – a superb computer aided drawing program on both tape cassette and a 5¼" floppy disc with its own manual. It is suitable for a wide range of uses including preparation of illustrations, architectural and engineering detail drawings, teachers' worksheets, and just creating your own pictures. It soon becomes addictive.

AMX ART includes full use of on screen menu boxes, icons, and pull down menus so that beginners find it very easy to learn and gain confidence in the use of the B.B.C. Micro.

An ICON DESIGNER program which enables you to create and store icons for use in your own programs.



ICON DESIGN PROGRAM

TECHNICAL REQUIREMENTS

The AMX MOUSE can be used with any B.B.C. Model B computer fitted with the Operation System 1.2 and is compatible with the second processor and disc or tape filing systems.

The AMX MOUSE is adjustable for sensitivity via software control and three buttons can be programmed to simulate 24 different key codes.

The AMX MOUSE may be disabled by a simple software command and will then not interfere with normal operation of the computer.

The AMX ART programme enables users to print out screen displays using any Epsom compatible dot-matrix printer. Owners of non-standard printers may use their own screen dump routines.



'Wordwise' is a wordprocessing program by Computer Concepts.
'View' is a word processing program by Acornsoft Ltd.

ICON DESIGN PROGRAM

DECISIONS DECISIONS



'Attack on the Somme', Tressell Publications, 139 Carden Avenue, Brighton, Sussex BN1 8NH, £13.99. '1914', Netherhall Software, Cambridge University Press, Edinburgh Building, Shaftesbury Road, Cambridge CB2 2RU, tel: (0223) 312393, £15. 'Relationships', BBC Soft, BBC Publications, Schools Orders Section, 144 Bermondsey Street, London SE1 3TH, £14.95. 'Sea Cliff Erosion', Netherhall Software, £15.

THESE four pieces of educational software arrived for review and presented so many interesting points of comparison that it seemed worth looking at them together. They are all simulation packages for the 13-plus age-group, to help pupils learn about a complex process by making decisions and seeing their results.

Each package is accompanied by the sort of literature now customary with good-quality educational software: operating instructions, notes for pupils and teacher, maps, illustrations, and other background material necessary to put the simulation into context.

Attack on the Somme

I received tape versions of the Netherhall software and disc versions of the others, all of which loaded and ran without errors. Two small quibbles about the disc packages: *Attack on the Somme* does not use auto-boot, and the documentation for *Relationships* does not specify that the routine to convert from 40 to 80 track format and vice-versa operates only on drive zero.

So much for technicalities – what about content? By coincidence two of the packages dealt with aspects of the First World War. *1914* is a reconstruction of the first six weeks, when the national armies were still mobile; *Attack* recreates a later period when the opposing forces had dug themselves in for the long war along the Western Front.

Both simulations involve military strategy, and my first reaction was that it was a pity to employ scarce computer resources in fighting old battles. But the underlying educational objective in both cases is to show that there are no real winners in war – a lesson more relevant today than it has ever been.

1914

Attack comes with abundant supporting documentation describing the realities of life in the trenches. It also includes an informative introductory program explaining such techniques as mining, bombardment, reconnaissance, attack in wave formation, etc, and pointing out discrepancies between military theory and practice. *1914* takes a slightly more dispassionate approach, aiming to help pupils master the confusing details of troop movements and battles, but the cost of the campaign in human lives is sufficiently emphasised.

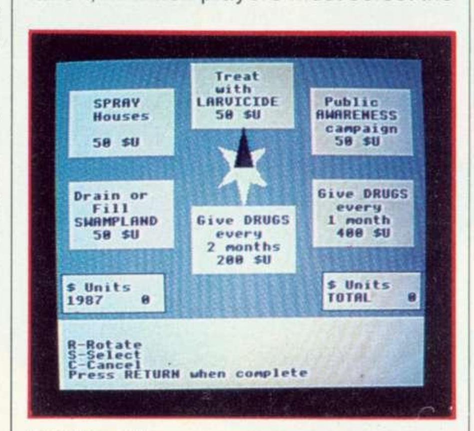
The major difficulty with historical simulations is that the more freedom of action given to the players, the less probable it is that the outcome will correspond with reality. The designers of these packages have tackled the problem in different ways.

Attack confines itself to the first day of the Somme Battle, putting the players in the position of General Haig. They must decide upon such issues as length and concentration of bombardment; use of explosive mines; placement and use of infantry, and time and method of attack. The program analyses these choices to produce a prediction of gains and losses, making a comparison with Haig's own result at the same point. But there is no carry-over into a second day.

By contrast, *1914* puts the players in charge of an army corps, as cogs in a larger machine, whose decisions can be evaluated but will not drastically alter the course of history. It is a competition in seven rounds between three teams representing Britain, France and Germany. Each round marks a separate phase in the campaign, and a choice of three strategies is presented to each team. When all the teams have made their decisions they are shown what happens in consequence, and marks are allocated or deducted accordingly. But the next round will begin again from a predetermined position.

The two programs differ greatly in presentation: *Attack* uses mode 1 graphics (of rather uneven quality) while *1914* uses mode 7, needing to carry a large quantity of text to respond adequately to the wide range of choices allowed. In the classroom it would probably take several lessons to work through the program even once, but the current position can be saved and restored in a straightforward manner. In the end, teachers' attitudes to these packages will depend upon their feelings about war games in general, but both can be respected as thoughtful attempts to handle a difficult topic.

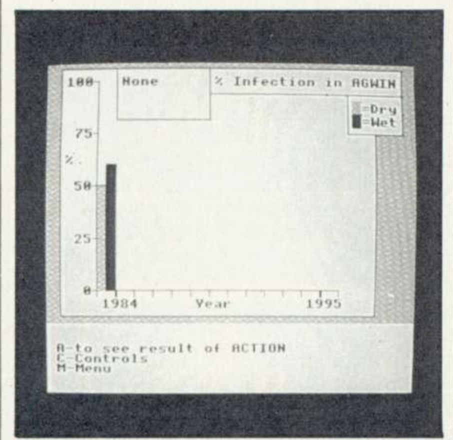
Relationships has more forward-looking theme: the eradication of malaria in a Nigerian village. This is a typical 'allocation of resources' simulation, in which players must select the



Relationships

best combination of measures (within financial constraints) to reduce infection over a six or 12 year period. Possible controls are drainage or spraying of the swamps where mosquito breed, hut spraying, administering drugs at monthly or two-monthly intervals, and public awareness campaigns.

There is a much greater degree of freedom than in the historical simulations – effects of decisions carry over from year to year and random elements such as drought or flooding may also come into play. You can consult a database for information about past decisions and results, either in the village on which the simulation is based or in other villages with different characteristics. A simple query language is provided for interrogation, so as a side-

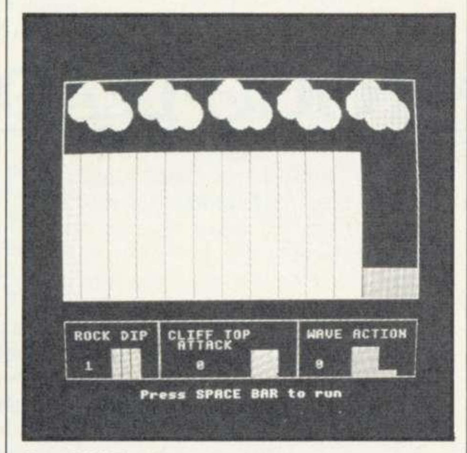


Relationships

effect the package gives practice in information retrieval techniques.

The user interface is unusually sophisticated, based on the fashionable 'desk-top' presentation with overlapping documents, and fancy cursor-driven methods for option selection. Perhaps someone should buy the programmer a mouse for his birthday! However there is a price to be paid, in the form of delays while screen windows are drawn and coloured in graphics mode, and program segments and data are read from disc. The disc drive works hard during this program, which is the only one of the four not available on tape. *Relationships* is designed to be used in conjunction with BBC Schools *Science Topics* broadcasts – it is very professional in approach and gives a useful insight into a vital area of decision-making.

The final package, *Sea Cliff Erosion*, is the most straightforward – its purpose is to demonstrate the process of undercutting from below and weathering from above which causes sea-cliff erosion and the build-up of beaches. It can be used as an animated text-book diagram, with which pupils can explore the interactions between eroding agents and rock formations to produce distinctive cliff shapes. The booklet refers to actual examples on the south



Sea Cliff Erosion

and Welsh coasts. This is an interesting idea worthy of further development – perhaps a subsequent version could also illustrate the effects of different rock strata within the same cliff. The graphics are adequate for their purpose, but there are too many straight lines for realism and most pupils will have seen more subtle effects on the BBC micro.

This is a competent but limited package, which in my view must represent less programming effort than the others. Like the other Netherhall software, it's an MEP subsidised issue, yet its price is £15, and I wonder how many teachers will think it worth paying that amount for the relatively small amount of classroom time involved.

At present, high production costs and small impoverished markets make the economics of educational software publishing very uncertain. The batch of programs reviewed here is a good sample of what is currently available, but better ones will become possible as our horizons widen and techniques improve. It is to be hoped that influential bodies like the MEP will encourage the production of imaginative software at realistic prices. **Susan Jones**

High percentage maths programs

'Maths Topics 2', Netherhall Software, Cambridge University Press, Edinburgh Building, Shaftesbury Road, Cambridge CB2 2RU, tel: (0223) 312393, £15

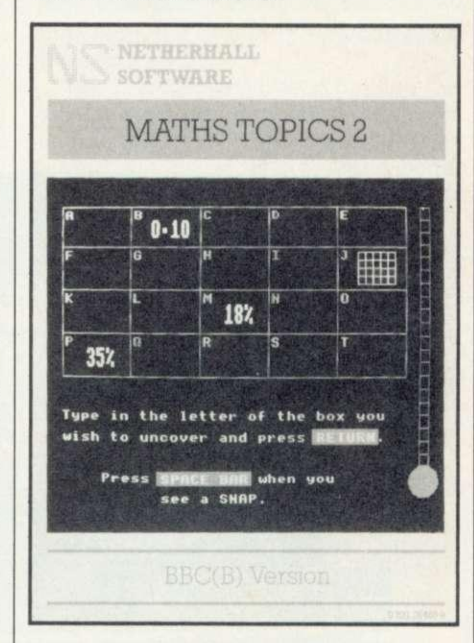
THE two programs in this package both deal with the topic of percentages. They have a good background as they have been developed by Netherall Software in conjunction with the MEP. The authors have steered clear of the sensational approach and there is nothing gimmicky about these programs – but they are still very interesting and practical applications of the computer to a teaching situation.

The first program is 'Percentage Families' and teaches the relationship between percentages, decimals and fractions. It does this by a series of graded tests which are intended to supplement previous standard classroom teaching. These tests display all three elements on the screen as well as a graphic representation of how many hundredths are being used.

The pupil then fills in the missing element. For example, the display may show:

31/100 0.31 ?%

Having answered correctly the child moves to the next level.



The teacher is able to see what has happened if the child hangs up the program on the 'Help needed with....' page by pressing Shift and Escape.

The documentation includes a series of worksheets which are well designed and, above all, photocopiable.

The other program, 'Percentage Snap', reinforces what has been learned by turning it into a thought-provoking game. A grid of squares is shown on the screen, each labelled with a letter.

By pressing any particular letter a percentage, decimal or fraction is revealed. When two appear that match, for example 3/10 and 30%, the child presses the space bar and a 'thermometer' scale rises for each correct 'snap'. There are ten 'snaps' in each grid so all the elements are used.

Both programs are well designed, robust and useful as a point-of-teaching aid and for revision. **Nick Evans**

A full LOGO for the BBC model "B" from Logotron.

Logotron LOGO, an LCSI Standard Logo, is now recognised as the fastest and most powerful implementation of Logo available on the BBC Model "B". Copies are now being despatched from stock to satisfied customers around the country.

Logo is a computer programming language which appeals equally to children in primary school and to computer scientists at the Massachusetts Institute of Technology. Logotron LOGO is being bought by:

LOGOTRON LOGO LEADS THE WAY!

Parents who want to keep up with their computer-literate children, but thought they were too old to learn a programming language;

Parents and teachers who are fed up with BASIC and depressed at the poor quality of most educational and recreational software;

Computer users of all ages who are looking for a simple yet powerful introduction to tomorrow's world of artificial intelligence;

Teachers who are looking for ways of helping children with special needs, who may be dyslexic, autistic, or just unusually intelligent.

Logotron LOGO is being used to drive robots, create animated games, create a new generation of educational software, and introduce computing to a new and sophisticated breed of computer user.

The software is contained on a single 16k ROM, and is infinitely flexible through the creation of disk-based extension modules. The manual, contained in a handsome loose-leaf binder and library case, provides all the information needed to write your own software, whether you are a veteran programmer or a total novice.

Educational users can take advantage of a special 'Classroom Pack' introductory offer, open until 31 March 1985, which consists of 10 LOGO ROMS, one full set of manuals and 10 mini-manuals for only £300 (plus £40.51 VAT). Less than half the unit cost of a single system.



LOGOTRON

Logotron Limited, 5 Granby Street, Loughborough, Leicestershire LE11 3DU.

To: Logotron Limited, 5 Granby Street, Loughborough, Leicestershire LE11 3DU. ☐ Please send me ______ Qty. Logotron LOGO(s) for the BBC Model "B" at £67.34 (inc. VAT) each and my FREE £10 voucher (Redeemable against future purchases of Logotron software and hardware). I understand postage and packaging are free.** ☐ Please send me further information concerning Logotron's LOGO for the BBC Model "B". ☐ Please send me further information concerning classroom packs. ☐ tick as applicable.

I enclose a cheque/postal order for £ ________ payable to Logotron Limited (Delete as necessary). NAME ________

ADDRESS ________ POST CODE ________

☐ Home User; ☐ Educational User; ☐ Computer Manufacturer*; ☐ Distributor* *attach to company letterhead. A.U.

**The £10 voucher and free postage and packaging are available only to customers who enclose payment with their order.

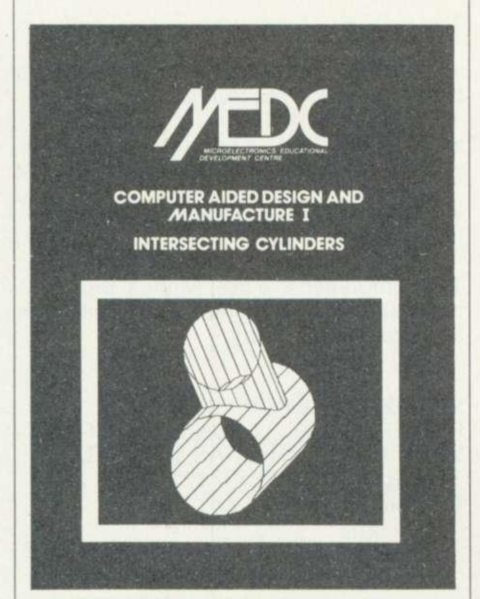
Trade enquiries welcome.

Design without the drag

'Computer Aided Design and Manufacture I: Intersecting Cylinders', Microelectronics Educational Development Centre, Paisley College, High Street, Paisley, Renfrewshire PA1 2BE, BBC (40 track disc only), £12

THE rather grand title of this software somewhat hides the fact that it is concerned only with the solid geometry of two intersecting cylinders.

The programs auto-run from disc. Once the diameters of the two cylinders and the angle at which they intersect have been entered, the program generates a wire frame side-on view. The



object can now be rotated about X, Y and Z axes by pressing a function key followed by the amount of rotation required. A zoom feature allows the image to be inspected in detail, and a further function key allows the image to be reset to its original aspect.

Once you've obtained your desired view, function key 7 will produce a surface model with the two cylinders appearing to be solid, but I found this difficult to see on a monochrome monitor.

Finally, and perhaps most usefully, developments of the two cylinders can be drawn on the screen. The documentation suggests that these can be traced from the screen onto paper, allowing a model to be built, but the author admits this is not easy and is prone to inaccuracy.

The documentation includes an A5 booklet and three A4 sheets. The booklet is adequate, describing all the functions of the software and including appendices on the solid geometry theory and equations used in the package. The extra sheets include a function key overlay and sample developments.

The introductory information on the packaging claims that, 'This package gives an introduction to computer aided design and manufacture. It illustrates how a computer can take over much of the routine of design; how computer graphics can be used to see what an object looks like before it's made; and how the design data held in a computer can be used for manufacture.' This is quite true, but I know from painful experience just the sort of questions a group of perceptive and cynical students would ask: 'What about three cylinders?'; 'What if I want octagonal pipes?'; 'Can it analyse flow turbulence?'; and, the most common one, 'Can we play invaders afterwards please?'.

What MEDC are attempting to do with this package is laudable. However, students tend to be critical unless it can be demonstrated that this type of computer aid would be directly useful to them. If this package were introduced halfway through a project involving intersecting cylinders, after the students had already attempted to produce the developments themselves by hand; and if a plotter or printer were used to draw the developments, I don't think the students would need to be told how useful CAD can be. As always, it's the application and integration of the software that is of prime importance.

Chris Steele

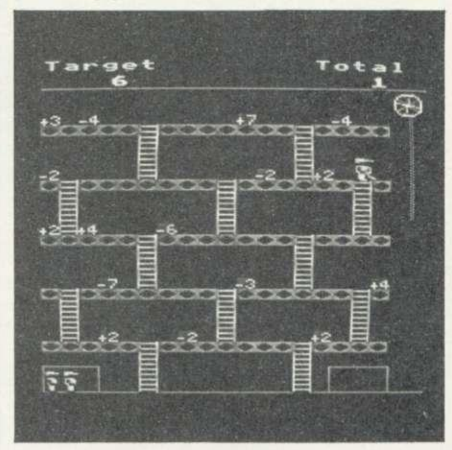
Painting to numeracy

'Number Painter', ASK, London House, 68 Upper Richmond Road, London SW15 2RP, tel: 01-874 6046, BBC B, £9.95

ALREADY famous for their high quality educational software which children enjoy using, ASK has now produced a package appealing to many levels. This arcade-type game is intended to teach and practise basic number skills and bonding. The 'painter' – one of four ranging from Mr Plod to Mr Speedy – climbs the ladders and walks the platforms to paint out the numbers which will take you to a 'target' total. For example, you may start with a total of 12 to your credit and your 'target' is 96. By painting out a '× 8' or a series of addition numbers you attain the target.

It's not always as simple as that – sometimes your starting total is higher than the target and so subtraction and/or division have to be used. All this has to be done against the clock of course, represented by a bucket being winched up the right-hand side of the screen.

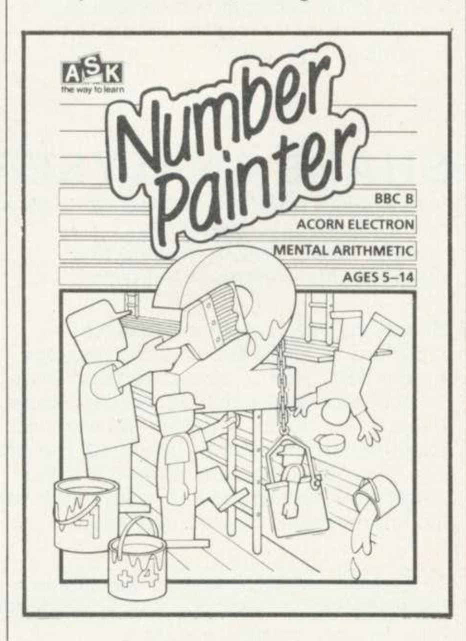
If you are successful at least two out of three goes on any level then you move to the next stage with correspondingly harder tasks. Failure means



that you get a further three attempts at the same level.

The program may be run using joystick or keyboard, and a self-test facility is included to allow the child to test his understanding of the number bonds and their relationship at any given level.

The theoretical pedigree behind this program is immaculate and its objectives are stated clearly – to reinforce the relationship between addition and subtraction; the relationship between multiplication and division; that repeated addition is a way of solving a multiplication sum, though inefficient;



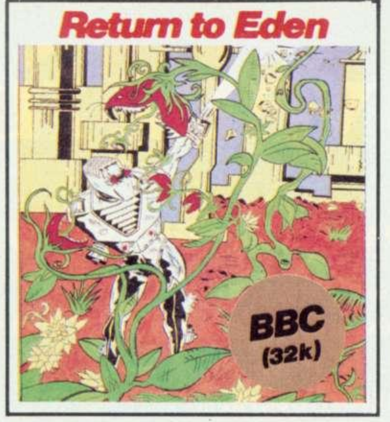
and that similarly, repeated subtraction is a possible but inefficient way of doing division.

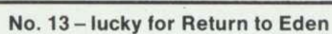
A splendid program with excellent graphics – and children actually want to use it!

Nick Evans



Still in the Elite position




No. 13 – lucky for Return to Eden



Mr EE – conjured up to no. 5

SOFTWARE CHART



		TITLE	PUBLISHER	PRICE	MICRO	REVIEWED
1	(1)	Elite	Acornsoft	£14.95 (£17.95)	B/E	October '84
2	(2)	Sabre Wulf	Ultimate	£9.95	B	
3	(5)	Manic Miner	Soft Projects	£8.95	B	
4	(3)	3D Grand Prix	Software Invasion	£7.95	B	February '85
5	(11)	Mr EE	Micro Power	£6.95 (£9.95)	B	March '85
6	(6)	Frak!	Aardvark	£7.50	B	September '84
7	(9)	Scrabble	Leisure Genius	£12.95	B	
8	(4)	Jet Pac	Ultimate	£7.95	B	
9	(7)	Eddie Kidd's Jump Challenge	Martech	£7.95	B/E	March '85
10	(8)	Football Manager	Addictive	£7.95	B	March '85
11	(re)	Aviator	Acornsoft	£14.95 (£17.95)	B	May '84
12	(10)	Bird Strike	Firebird	£2.50	B	
13	(17)	Return to Eden	Level 9	£9.95 (£11.95)	B	
14	(12)	Pole Position	Atarisoft	£9.99	B	March '85
15	(18)	Chukkie Egg	A&F	£7.95	B/E	September '84
16	(19)	Zalaga	Aardvark	£7.50	B	
17	(14)	Fortress	Pace	£8.95	B	September '84
18	(re)	Hobbit	Melbourne House	£14.95	B	
19	(—)	Kensington	Leisure Genius	£12.95	B/E	
20	(16)	Mini Office	Database	£5.95 (£7.95)	B/E	

B = BBC. E = Electron. re = re-entry. Prices in brackets are for disc version.

BUBBLING UNDER

Chess	**various**
First Steps with Mr Men	**MirrorSoft**
Felix in the Factory	**Program Power**
Snooker	**various**
Missile Control	**Gem Software**

Compiled by RAM/Computer

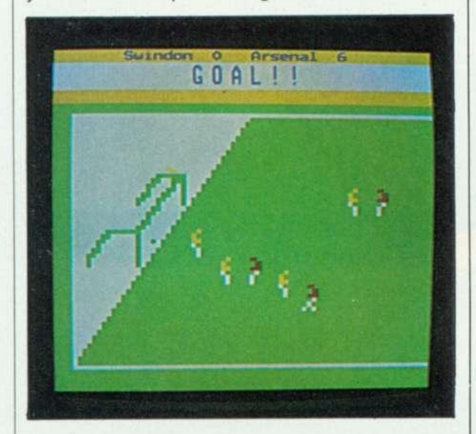
Soccer supremo

'Football Manager', Addictive Games, BBC B, £6.90

WHAT an interesting game. When you kick off (to coin a phrase), you're at the bottom of the fourth division, managing a side of your own choice. Naturally, I picked Manchester United, but if you really want a laugh you could pick Arsenal, Liverpool, Accrington Stanley or some such band of one-legged brigands (Bruce got his revenge on the screenshots!).

You're allowed a squad of 16, and you have to look after them, making sure that their energy levels don't fall too low (it's the women you know, but what can you do?). When you need to bring in some new blood the transfer market is open to you. If you're a bit broke you can tap that ever-friendly supplier of funds and part-time carrion crow, your bank manager.

You have to guide your squad through the full season. If you're something of a star supremo, like what I am, you move up through the divisions



quite quickly – how fast depends on which of the seven skill levels you've chosen. Edited highlights of each game are shown, just to torment you and reduce your nails to tatters. Mode 7 '3D' graphics are used to surprisingly good effect here.

It really is a very gripping game as you battle through, plagued by injuries and financial worries, but the joy of that lap of honour round the living-room after you've thrashed Spurs 5-0 in the Cup Final makes it all worthwhile.

One gripe. Me and the lads was sick as a parrot when we was demoted from the first to the fourth divvy on account of we wasn't able to load our saved position. Saving the position is easy enough but reloading it is another bag of chips. When the main game has loaded, and it's very long, no screen messages appear to let you know that any attempt is being made to load your data file. If you haven't previously wound your data tape to the correct position, or if your tape player is a bit dodgy you're doomed to starting each session in division four and loading the whole game at least twice.

Otherwise excellent. **Harry Sinclair**

Lapping up the thrills

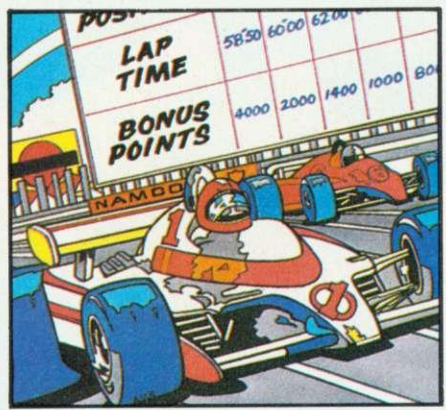
'Pole Position', Atarisoft, BBC, £9.99

ARCADE addicts will doubtless be familiar with the driving game *Pole Position*, in which you take the wheel of a racing car and drive very quickly round a circuit. Well, now you can do the same thing on your BBC micro as *Pole Position* has been adapted for it, retaining all the excitement and skill of the original.

You first undertake a qualifying lap; your time must be good enough to rate you in the first eight, or you won't get onto the grid.

Once a bonus for position has been given, the race starts and as it progresses, more and more cars appear in front of you, and they must be passed carefully if you are to get a good score. A countdown timer is displayed – 55 seconds are added if you complete a lap, but if it reaches zero the game ends because you are being too slow. However the game ends you are awarded a bonus of 50 points for each car you passed, and a time bonus of 200 points per second still on the clock.

The course is very similar to the arcade version, right down to the fourth bend, a very tight left-hander which has



to be taken carefully. The Atari balloon pulls messages across the track before the race, and the background scrolls. In fact, my only niggle about the graphics is the jerkiness of some movement. The car seems to lurch across the track, and the trackside signs jump towards you about ten yards at a time, but the rest of the graphics are above average. Sound is good, with engine noises and a great chuck-chuck sound as you hit the kerbs.

All in all, a very well written program – all it lacks are cars passing you, as on the arcade version, but that has a little more memory and power behind it!

Stuart Menges



So long, Cylons

'Space Station Alpha', Icon, BBC B and Electron, £7.95

THE mission in *Space Station Alpha* is for you in the last remaining space station to destroy incoming Cylons, preventing their deadly lithium torpedoes from reaching Earth.

When loaded, the screen went blank for about ten seconds while it drew stars and other objects. There don't appear to be any instructions on what keys to use, so I defaulted to *Killer Gorilla* keys and they seemed to work.

Unfortunately the screen never changes from a well-drawn view of Earth, the moon and the front of your space station. The enemy ships always come one at a time from the top right-hand corner, making it easy to hit them. Occasionally one slips through, and unless you're good at following Cylons with the sights, its ammo will hit Earth and lower the shield power.

The graphics are good if a little monotonous, and when the Earth-shields are fully drained a very impressive explosion takes place, with bits of planet spinning off in all directions and very realistic sound effects. Your laser consists of a white line briefly flashing on the screen, accompanied by a zap sound, but with good explosions.

To sum up, Icon has come up with quite an addictive 'annihilate the nasties' game, with fair but slightly flickery graphics. Sound is adequate and presentation colourful, but *Space Station Alpha* seems to have an amateurish feel. **Rob Fenton**

He's a crystal ball wizard

'Mr EE', Micro Power, BBC, £6.95 (disc £9.95)

MICRO Power's range now includes this excellent version of the popular *Mr Do* arcade game. The idea is to guide a wizard (Mr EE) round various screens, collecting groups of cherries and killing monsters called Umphs who try to stop him. There are two ways of disposing of an Umph – the apples dotted around the screen may be pushed or dropped onto the creature, or Mr EE can resort to throwing his crystal ball at it.

When all the cherries are eaten or all the Umphs are vanquished, the screen ends. There are ten different screen layouts in the shape of numbers.

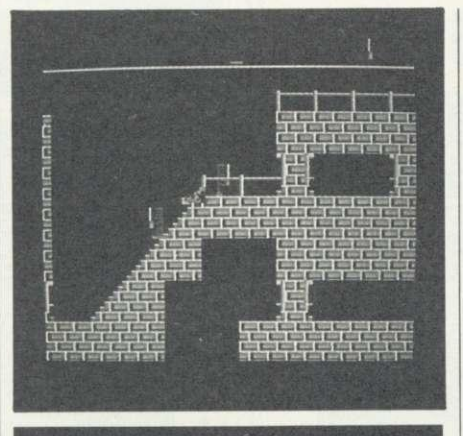
At the top of the screen are five special letters – E, X, T, R, A. Every 5000 points, one letter turns into a letter monster, and if this is killed the letter changes colour. Once all five have been collected you gain an extra life. If Mr EE walks over the Umphs' hideout at the centre of the screen, a letter will come on, and three especially nasty characters appear. On killing them, the game speeds up.



As for graphics, the game follows the orginal almost exactly – in fact it's hard to tell the difference. Movement is smooth, colour has been used well, and the backgrounds are cleverly done – some are stripes or mottled. Sound is also above average.

I have only one or two slight criticisms of *Mr EE*. Once, for no reason, the game locked up on me. There is also a bug which causes a dead Umph to continue falling from top to bottom of the screen again and again. Annoying, but it's a rare occurrence.

Apart from these minor problems, we have another classic arcade game to follow the excellent *Killer Gorilla*. The whole program is very well written, a delight to play, and, I'm sure, a best-seller for the Beeb. **Stuart Menges**



Who'll be king of the castle?

'Castle Quest', Micro Power, BBC, £12.95 (disc £14.95)

NOW that *Elite* has broken the games mould and set the standard for the future, it's good to see Micro Power following in Acornsoft's footsteps. *Castle Quest* is, I quote, '. . . an interactive adventure and strategy game with arcade-style action and graphics'. It's rather a mouthful and a lot to live up to, but this sentence actually sums up the game quite accurately.

The scenario is a castle, and the aim is to use the various artifacts that just happen to be scattered about to solve puzzles, so that you can make a complete tour of the castle. Without giving too much away, I'll say the artifacts include swords and oxygen cylinders.

The puzzles? Well, for instance you've been caught by some nasty green guards, dumped into a dingy dungeon, and all you have in the cold with you are a stool, a bed and a burning torch much too high for you to reach, and you must escape.

The fun of the game is in how you play it, and it's certainly a challenge – so much so that Micro Power are offering £1 to every person who can solve the puzzle within three months of purchase, and a further £500 worth of computer equipment to the winner of a future competition between the four highest scorers.

Visually *Castle Quest* is easily identifiable as a Micro Power game. There's little use of sound other than the pitter-patter of feet, and mode 2 provides some good use of colours. The characters include the odd wizard and lots of little red monkeys running everywhere, and the game introduces the delightfully named Scrollerama – a technique for producing the best hardware scrolling I've seen yet on the Beeb.

Thirteen keys are used in all, though you can use only ten at any one time. However, because the game is not an all-out arcade game this is not a problem. Scoring is almost impossible!

Although *Castle Quest* is an on-going adventure it's not possible to save your present position, so you must start each game anew.

While not jumping into *Elite*'s shoes *Castle Quest* follows closely in its footsteps, and although not cheap it's certainly worth buying. **Bruce Smith**

On your bike, Eddie

'Eddie Kidd's Jump Challenge', Martech, Martech House, Bay Terrace, Pevensey Bay, East Sussex, BBC B and Electron, £7.95

YOU start Eddie Kidd's official *Jump Challenge* by completing a few practice jumps over barrels on a BMX bike. I didn't see much point in this as it seemed to waste valuable program space which could have been used to enhance the graphics.

Anyway, once you've managed to negotiate the jumps on the BMX you're allowed to try it on a motor cycle, and this time the objects are cars, trucks and jeeps. If you fail, it's back to the BMX for more practice.



The sideways scrolling of the screen is very good, although I did notice a slight amount of flicker in the graphics. Control of the game is either keyboard only or a combination of keyboard and joystick – I found keyboard only the easiest.

There is of course the competition – the winner is the person completing the longest jump, and you are able to save this on to tape. The game gets very boring after a short time – I even recruited a few children to play it and they felt the same – and at £7.95 it's a bit pricey.

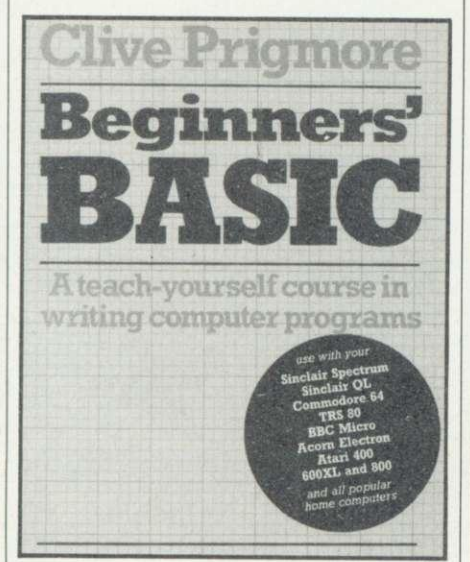
Dave Morgan

First steps in learning to program your micro

'BBC Micro B Starter Pack', Ken Bodley, Doug Brown and Brian Samways, Collins Software, £19.95. 'Beginners' Basic', Clive Prigmore, Windward, £9.95. 'Very Basic Basic: the first 15 hours on your Electron', Derek Ellershaw and Peter Schofield, Century, £2.95

IF you've just got your BBC micro or Electron you may be rather baffled by it and on the lookout for useful books to teach you to use it and to program it in Basic. I'll review three such packages aimed to help you find your feet in the world of micros.

The *BBC Micro B Starter Pack* is a



sixty page A4-sized book containing two cassettes in a plastic wallet. It was developed at the Birmingham Educational Computing Centre and aims to teach Basic in 'a painless and informal manner'.

The book is well laid out with clear print, and it is obvious that the authors have much experience of introducing beginners to computing: for instance the text clearly identifies which keys to press by a small picture of a key shape with the legend inside. There are also many black and white photographs showing what the screen should display.

The text leads the beginner through the use of the keyboard and gently into Basic with plenty of examples and exercises. It's remarkably free from the clutter of jargon that surrounds micros, and terms used are fully defined. The book also explains in detail how to connect up the computer system, and load and save from cassette.

Some of the programs on the two cassettes are demonstrations of the potential of the computer; others are used to support understanding of each chapter. They let the beginner get on with the programming without the problems of typing listings into the machine correctly. My only criticism is that the graphics demonstrations at the end leave a lot to be desired.

The *BBC Micro B Starter Pack* is the most expensive of the beginner's books but remember the price includes the two cassettes. It works at a sensible pace, provides a useful well-structured introduction to Basic and its lively, sympathetic approach should appeal to the BBC micro owner who wants to learn to program.

Beginners' Basic is claimed to be a teach-yourself, step-by-step guide to computer programming which can be used with all popular home computers including the BBC micro and Electron. Any book suitable for all popular home computers must be a compromise and cannot deal successfully with all the idiosyncracies of each, and this is no exception.

Beeb and Electron owners will be disappointed to find the only references to their computers are on the front and back covers: there is no mention of the differences between the various machines or alternative programs. The beginner to BBC Basic will be left wondering why his or her machine

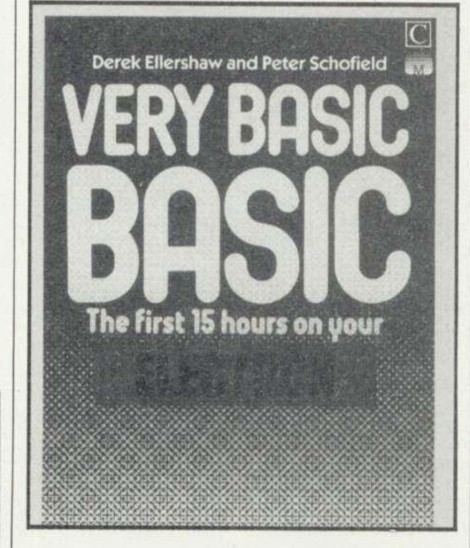


does not always give the same results as those in the book. Some of the programs will not run on the BBC micro or Electron, and others have a different screen format from the printouts shown.

Another limitation is that because the book aims to be suitable for all computers it cannot deal with the Basic keywords, which vary greatly from machine to machine. The book, therefore, does not deal with sound, graphics, procedures, or saving and loading files. Some keywords available on many versions of Basic, but not BBC Basic, are included in programs, and this is not stated in the text. An example is the keyword RANDOMIZE, which BBC Basic does not recognise – the text mentions that the keyword is often not needed, but does not point out that it's not available in all versions of Basic and will cause an error.

I do not feel this book would inspire the beginner with confidence and enthusiasm. The style is rather dry and lacking imagination, the screen printouts do not always look the same as in the book and there are no sections to deal with individual machines and their differences.

Very Basic Basic is a paperback which aims to guide the beginner through the first hours and weeks of

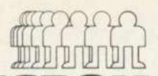


understanding of Basic. It does not claim to be a full manual for Basic, but to provide a foundation for understanding the more complex books on programming.

It's well laid out and readably written, starting off by explaining how the Electron is connected up, and how to use the keyboard. There are chapters on loading and saving, and the use of types of printer. Although technically nothing to do with learning Basic, most newcomers find such information useful. The book is rather optimistically subtitled – a beginner would be hard-pushed to complete it in the first 15 hours.

There are many short examples to be worked through and each is carefully explained. The reader is encouraged to experiment with programs and try out variations.

A useful book for the beginner who wants to learn programming, at a very reasonable price. **Martin Phillips**




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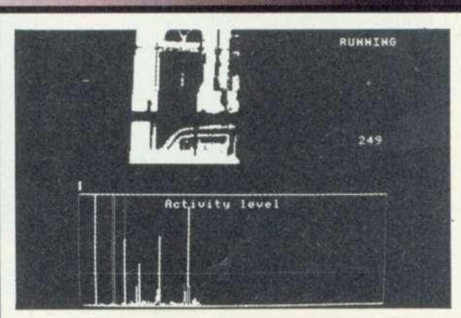
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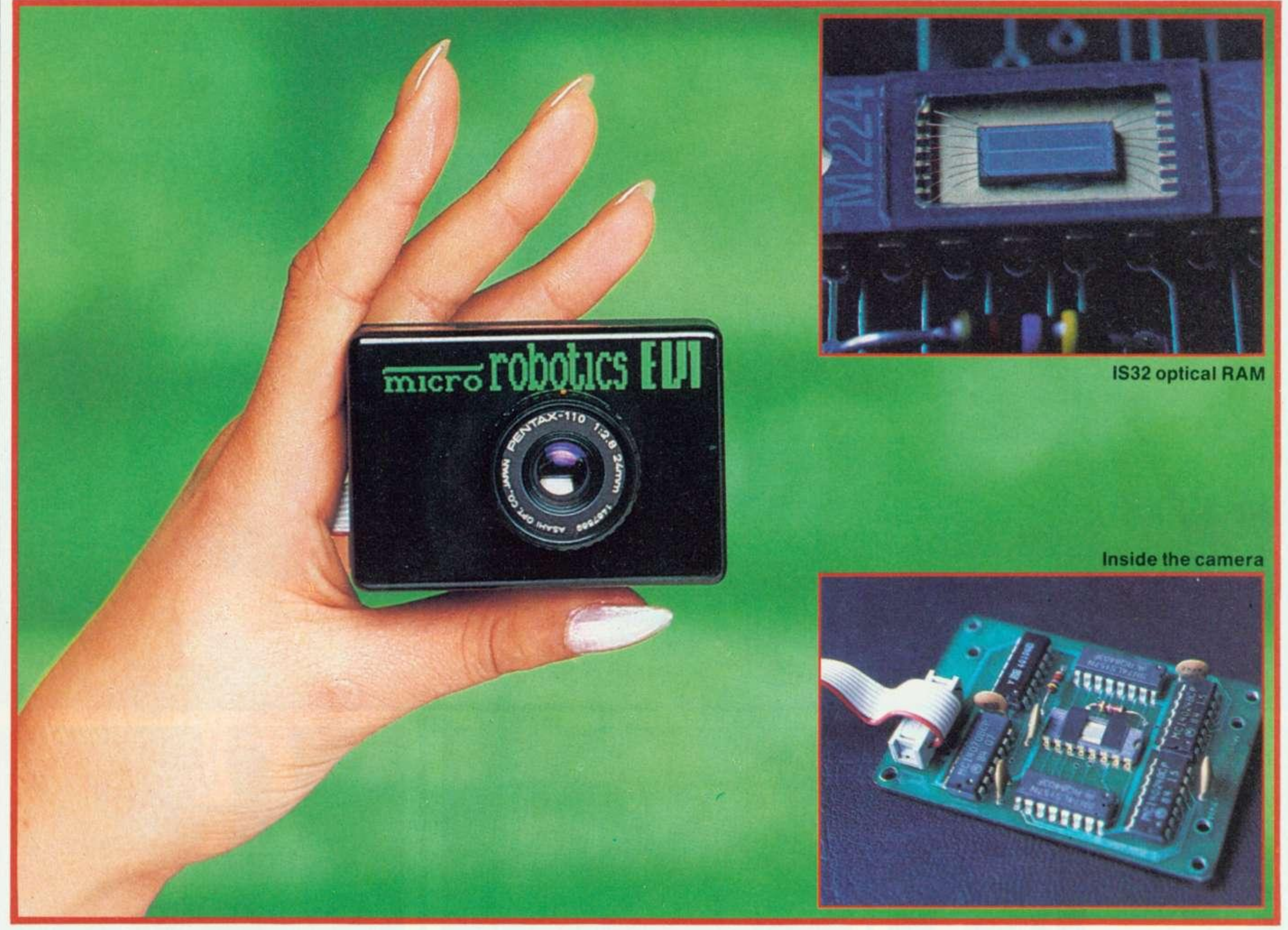
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Inside the camera

Malcolm Banthorpe focuses on a dynamic RAM camera

PHOTOGRAPHY: ALEXIS LAWSON-THOMAS

Micro-Robotics EV1 solid-state camera, Commotion, 241 Green Lane, Enfield EN3 7SJ, £129.95 (inc. VAT)

IF YOU were to remove, accidentally or otherwise, the top from any silicon integrated circuit package, chances are that you would find its operation would be affected by the light. Most semiconductor junctions are sensitive to light to a greater or lesser extent. An enterprising manufacturer has realised that the potential of using dynamic RAM (many times cheaper than a CCD array of similar size) as a low-cost image sensor was too good to ignore, and has produced the IS32 optical RAM. This device has a quartz window like an EPROM and its cells are arranged as two 128 by 256 arrays. The IS32 is found at the heart of the EV1 solid-state camera.

The camera is housed in a black plastic case which is little bigger than a matchbox and is connected to the user port of the BBC micro via a seven-way ribbon cable. The image is focused onto the sensor by a 24mm Pentax lens with a bayonet mount and is interchangeable with other lenses (eg, zoom or wide-angle) if required. There is a standard tripod mount at the base of the camera, and a manual and disc of application software are also included.

A miniature camera which can be directly connected to the micro for £130 may seem too good to be true, so I'll point out its limitations:

- Each cell in a dynamic RAM is essentially a two-state device (either on or off) and so it's only possible to generate a two-level display (ie black and white) directly. You can build up a picture which displays intermediate grey levels by using multiple exposures.
- The exposure time required to discharge some of the cells to an off state will depend on the overall light level of the scene. The shortest exposure time available in the software, which works for fairly bright daylight (sunlight is

generally too bright without a filter), will allow a picture repetition rate of about 15 per second.

- The two 128 by 256 arrays which make up the sensor chip are separated by a narrow gap. As a result, a narrow strip of the image falling on the chip is not recorded and there is a horizontal line of discontinuity halfway down the picture, visible in the illustrations.
- The overall light-sensitive area does not conform to the 5 by 4 aspect ratio of the screen and so it is not possible to display an undistorted full-screen image, except by displaying only part of the image potentially available from the camera.

Most of the limitations outlined above are serious only if you're hoping to capture high quality images for display. The main potential of the camera lies in the areas of robotics, shape recognition and possibly security.

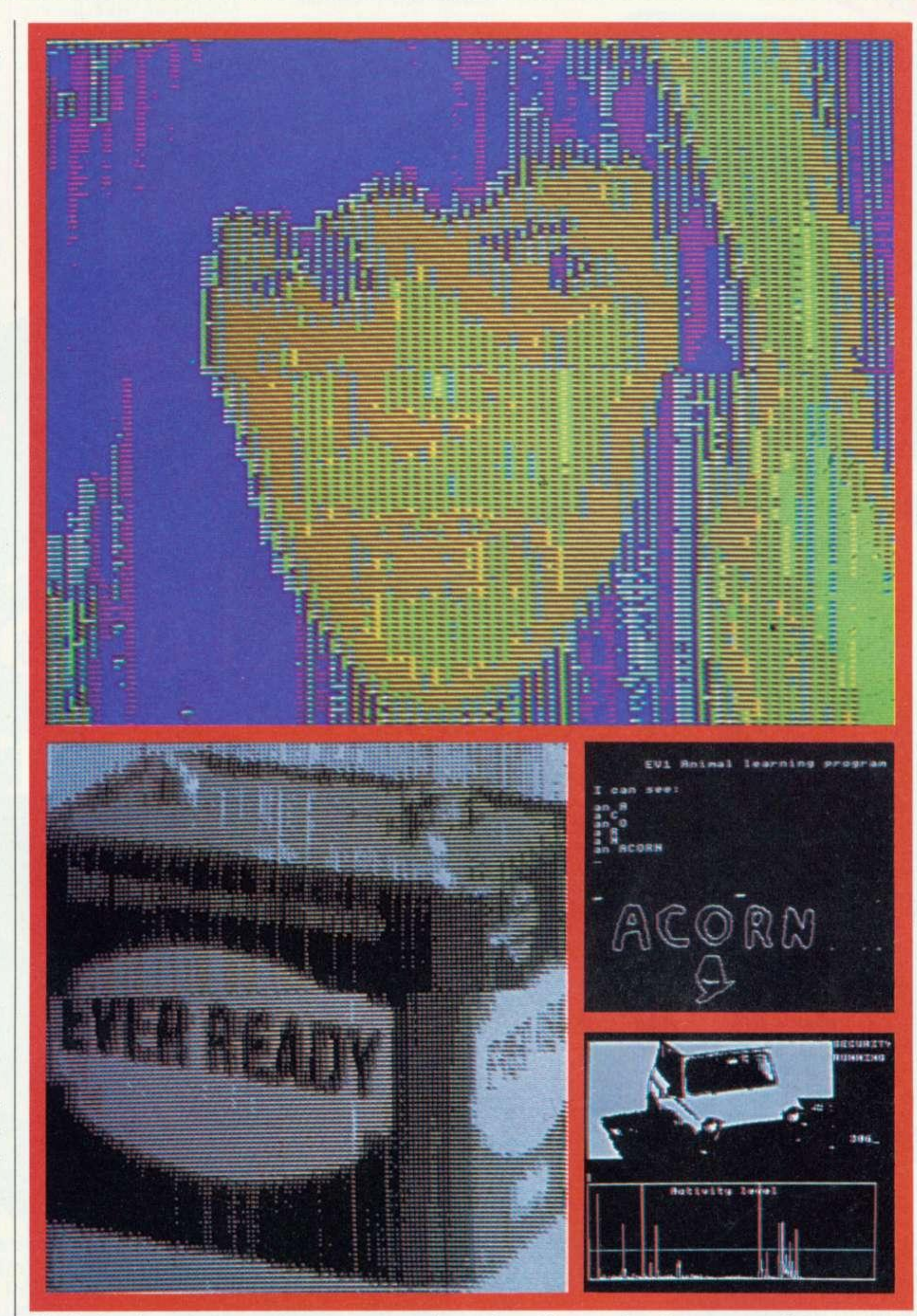
The programs supplied illustrate some of the possible uses: 'EV1' is the simplest program and repeatedly displays whatever the camera is looking at as a two-level image. Because there are only two levels, the adjustment of exposure is fairly critical to obtain the best results, and can be adjusted by means of the up and down cursor keys. There is provision for making a screen dump to an Epson printer.

'Movie' allows a number of pictures to be recorded and replayed in the form of a short animated sequence.

'Grey' displays a full-screen picture in simulated grey levels. Mode 0 is used and the picture shown is a combination of eight separate exposures. The manual suggests a method of creating colour pictures by means of multiple exposures through a series of different filters. I found that a pseudo-colour picture could be obtained by modifying the program to run in mode 2 and then changing some of the actual colours displayed by using VDU19.

'Secure' operates by detecting the changes between consecutive pictures which will be indicative of the movement within the camera's view. Having set the exposure, the program goes into 'learn' mode to assess the amount of movement generally present owing to moving trees, etc. The amount of activity in the scene is then displayed as a graph at the base of the screen, which takes about five minutes to fill the screen horizontally and is then cleared and repeated.

'Animal' is the most impressive of the programs supplied and shows the potential of even a simple image sensor in object recognition. The cursor keys are used as in 'EV1' to set the optimum exposure, but the software causes each object in the camera view to be displayed as a series of outlines. This outline information is used by the program to analyse each enclosed shape on the screen in terms of its area, perimeter and a number of other parameters. As a result, once the computer has been taught the names of the objects on the screen, it makes quite a good job of recognising them even if rotated or changed in size.



Clockwise from top: pseudo-colour portrait produced by running the grey-scaling program in mode 2; reading letters and a drawing with shape-recognition software; the security program watches a parked car; more from the grey-scaling program

The manual I received was only a provisional version but contained descriptions of the programs, background information on electronic vision in industry and suggestions for projects.

The main body of each program is written in Basic and with the information contained in the manual it shouldn't be too difficult to make modifications for your own use. The manual also contains details of entry points into the machine-code routines which are used to read to optical RAM, making it possible to write your own applications programs around them.

If you are looking for a vision system that will allow the capture of high quality images for the purposes of computer art then this camera is not for you. If, however, you wish to experiment with object recognition this is probably the lowest cost entry into this exciting field and the camera should prove well up to the task. Its smallness makes it eminently suitable for mounting on a robot.

TEN POINT TEST

How many marks out of 10 does George Hill give the Fastext 80?

Smith-Corona Fastext 80, £195 plus VAT

I BRIEFLY mentioned the Fastext 80 last month, and happily, its unfortunate demise after two days was speedily remedied by SC UK, who sent a replacement and tractor feed.

The Fastext 80 is a monochrome dot-wire printer – not colour as you may have been led to believe. It has eight dot wires in the printhead, and produces characters on a 9 × 8 matrix, with the bottom dot reserved for descenders (tails on g, y, etc). It is based on standard, even old-fashioned, technology and comes in its standard form without a tractor feed, and no roll holder. It is small, neat and capable of text and graphics. The graphics dumps produced rather unevenly shaded pictures (figures 1 and 2). The results of the test program (figure 3) illustrates the text styles available.

The dump programs this month for the Fastext are all in Basic, and can be used on any printer with 'plotter graphics' using the control code ESC*5

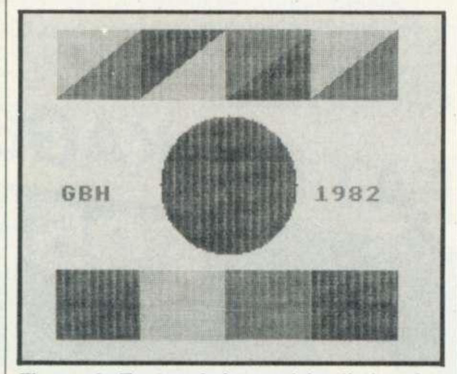


Figure 1. Testcard dumped by listing 2 – note the stripy quality

(Epson FX80, Canon PW1080A, Taxan Kaga). Listing 1 is a pattern dump for mode 1. It thus produces undistorted output, though the patterns are a little stripy.

Basic programs tend to be slow, so I have modified listing 1 to give the two-liner, listing 2. This runs at the maximum possible speed (I think – readers will probably tell me otherwise!), which is about one and a half times the speed of program 1. The modification includes: *a*) use of system integer variables throughout, *b*) deletion of REMs and *c*) deletion of spaces. The result is thoroughly unreadable, but faster.

Listing 3 is a similar pattern dump for a mode 2 screen, in fully packed form. It works on the same lines as listing 1.

To use listings 2 and 3 you can either CHAIN them from within your graphics program (having first performed a *OPT1,0 if you use tape), or merge them on to the program (*User Guide*, page 402), adding lines

```
29999 DEF PROCdump
30020 ENDPROC
```

and call them from within the program by inserting PROCdump at the point where you want the dump to occur.

Now let's get back to reviewing. Below is a list of ten desirable characteristics in a printer selling at under £200. I'll say how the Fastext 80 performs, and you can see how your own measures up.

First, the printer interface should be Centronics, as any other will involve either extra expense or inconvenience. Leads should be supplied (if bought from a dealer) and a mains plug fitted. If you don't insist on this, you might have to pay up to £20 extra! The Fastext 80 reviewed didn't have a lead, or mains plug.

Tractor feed and friction feed are essential as standard for paper handling, so that fanfold paper and single sheets can be used. Feeding paper in should be easy, and the tractor should be fully adjustable for width. A convenient way of tearing off the paper at a page end is also important. The tractor feed is not standard on the Fastext 80, though it's easy to fit, and is simple and convenient in use. Poor design hampers tearing off paper.

Push-button control is useful – you should be able to switch the printer on and off-line, and to formfeed and linefeed by just pressing buttons. The on/off-line button on the front of the Fastext 80 is highly inconvenient. There is no indicator light, and it's impossible to tell at a glance whether the printer is on or off-line.

You should be able to control by DIP (Dual In-line Package) switches the automatic linefeed; the character set nationality; the 'zero font' (ie, whether the zero has a line through it or not); the print style when switched on, and the 'form length' (ie, the length between perforations of your fanfold paper). These DIP switches should be readily accessible, and not require an initial dismantling job when you buy your printer. The only DIP switch on the Fastext 80 is for auto-linefeed, which is

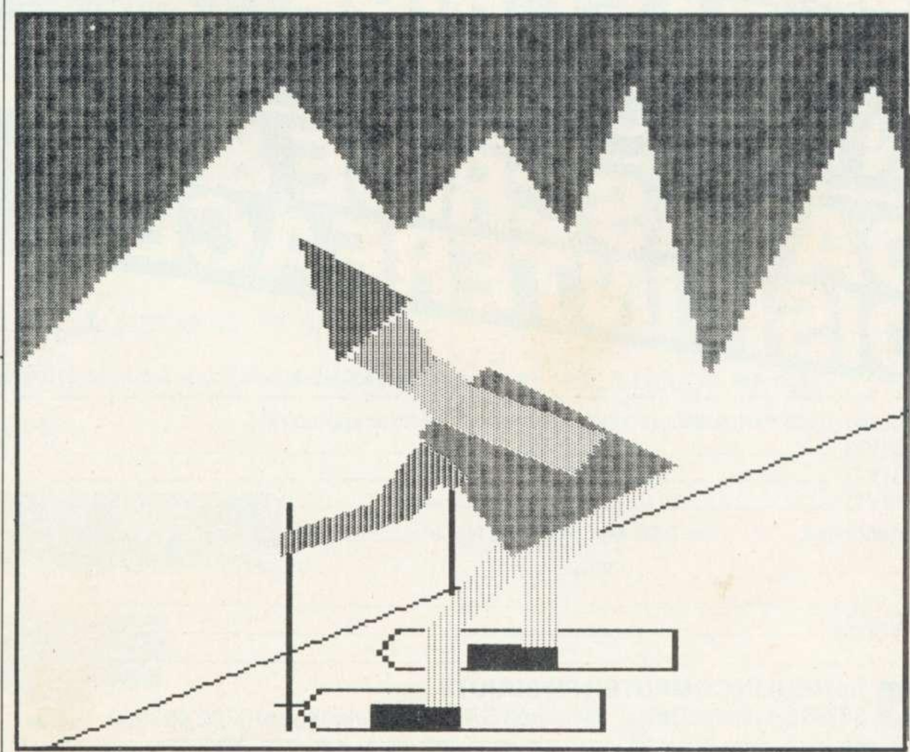


Figure 2. Picture of skier, by 10-year-old Miranda Hill, dumped by listing 3

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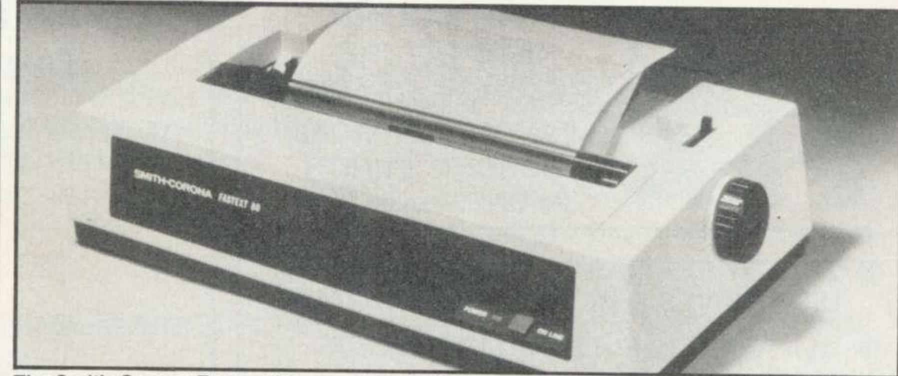
IMPORTANT NOTE:
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located on the back and is easy to alter.

There will probably be only one basic print style available, but it may be obtained in a number of sizes. There are normally three: Pica, Elite and Condensed, each of which should be able to be enlarged, and all these facilities are available on the Fastext 80.

You should also be able to make some print stand out from the rest, apart from using the style changes. The only form available on the Fastext 80 is underlining and this is very slow as it requires an extra pass of the printhead. Other methods are emphasised (double printing the dots on the same line), and double strike (double printing the dots in two passes, with a mini-line-feed between them).

Pin-addressable (bit-image) graphics of some sort are almost universal on modern dot-matrix printers. If your printer does *not* support the normal 'Epson-type' single and double density graphics modes (using the control codes ESC K n1 n2 or ESC L n1 n2) then you are cut off from a lot of published software, and may have either to write your own, or rely on other people. The single density graphics command is implemented on the Fastext 80, but the control code used is ESC*0 n1 n2 – hence most existing software will not run without modification. There are also 'no distortion' plotter graphics, using ESC*5 – this allows the printing of precisely round circles (figure 1). The maximum number of dots per line is 512 – not enough to produce a correctly orientated 'pattern' dump.



The Smith-Corona Fastext 80 scored 4 out of 10

The Fastext 80 is not obtrusively noisy. Printers always sound quieter in a shop than in your study, and quieter still when described by salesmen over the phone! You can't expect silence from any impact printer, but the noise should not drive you from the room.

As far as speed is concerned an advertised 80cps (characters per second) usually means about 55cps in average use. Anything slower will be irritating, and even this will be too slow if you use the printer extensively. The Fastext 80 rates at the low end of acceptable, with an advertised speed of 80cps and a benchmark figure of 54cps.

The manual is an important feature of a printer. If it is incomprehensible, you are prevented from using your printer's capabilities to the full. The Fastext 80's is glossy but uninformative, and badly laid out. Overall this printer seems rather overpriced – if it cost around £150 including VAT, tractor feed and leads, then it might tempt me.

George Hill's test listings and Miranda Hill's skier are on pages 109 to 110

Printed on the SMITH-CORONA FASTEXT80

Normal character set.

!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnop
qrstuvwxyz{|}~

Normal size Elite size Condensed pica size.

Enlarged pica.

Enlarged elite.

Enlarged condensed.

Now for the editors benefit the elloneohzero test.

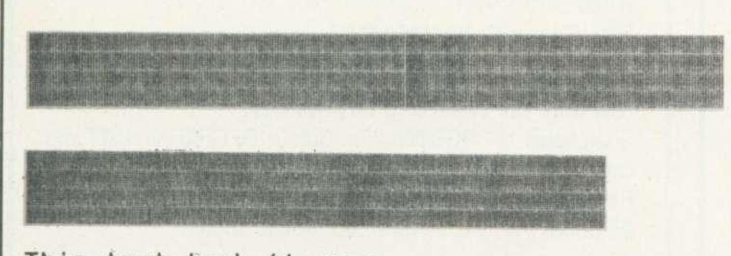
Il1-0Oo Il1-0Oo

Note that the square one is the zero!

Any word or letter may be underlined in any mode.

All types of print and graphics ▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲ can be mixed on one line.

Bands of dots are not too even.



This test took 46 secs.

Figure 3. The text styles available on the Fastext 80

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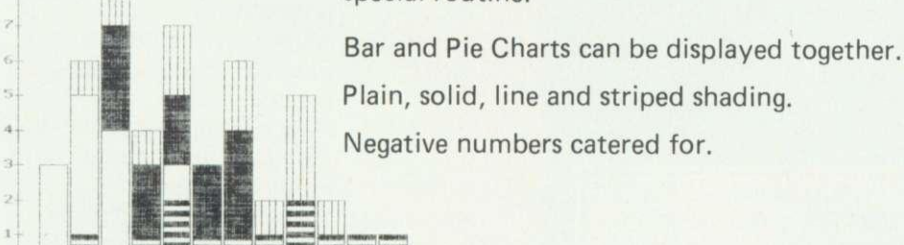
* AUTOMATIC DRAWING and SCALING OF AXES WITH OPTIONAL SELF LABELLING FACILITIES, TITLES, etc. (Coarse/Fine Cursor movement).
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* DATA ENTRY FROM FILE OR KEYBOARD INTO 4 FIELDS. (Range, All or Select Records from File)
* MINIMUM KEYSTROKES – Extensive use of FUNCTION KEYS
* COMPREHENSIVE EDIT FACILITIES – MOVE, DELETE, CHANGE, BROWSE
* SORT (Ascend/Descend) ON ANY FIELD
* RENAME FIELDS ETC., SAVE CONFIGURATIONS, DEFAULT VALUES
* SCREEN DUMP – ACCESS OWN ROM, APPEND OWN or SUPPLIED (FOR EPSON)
* SAVE/LOAD SCREENS
* TWO COLOUR MODE–CHANGE COLOURS IF REQUIRED
* TEST/FAMILIARISATION FILES AND FULL INSTRUCTION MANUAL

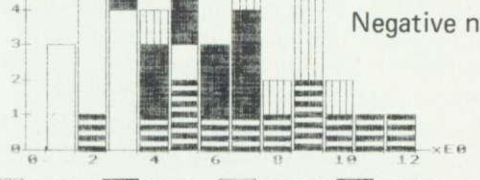
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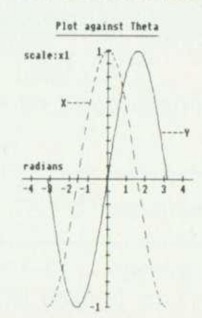
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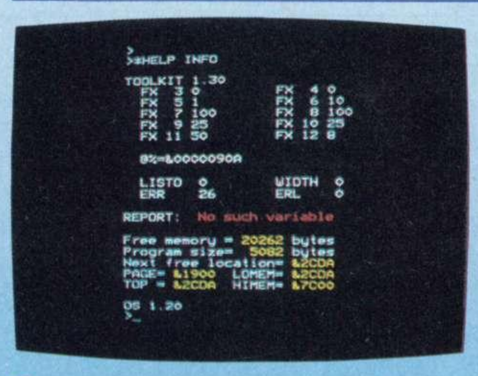
DISC (if applic.)

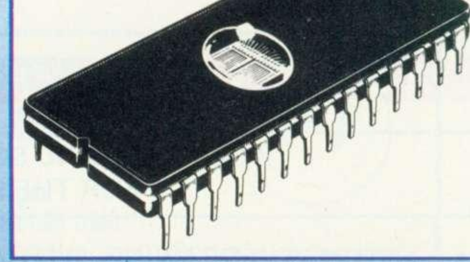
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```
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   3 Move lines
   4 List procedures and functions
   5 List A% to Z%
   6 List numeric variables
   7 List string variables
   8 List arrays
   9 Change edit range
   0 Edit program

   ESCAPE to exit

 Enter option: 1
Search string:  X%

  640 DEFPROCEVAL(U%,V%,W%, X% ,Y%)
  670 IFB%< X% A%=U%+2:ENDPROC
 1450 LOCAL X% ,Y%
 1460 $buf%=cmand$: X% =buf%:Y%=buf%DIV2
56

 Enter option: _
```

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*FREE	Display free memory and pseudo variables.
*HELP INFO	Display a screenful of useful system information.
*MEMORY	Display memory contents.
*MERGE	Merge a program in memory with one on disc/cassette.
*MOVE	Move program to run at specified address.
*NEW	As NEW, but can be issued from within a program.
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*UTIL 2	String search and replace.
*UTIL 3	Move Basic program lines.
*UTIL 4	List procedures and functions.
*UTIL 5	List values of A% to Z%.
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SPELLCHECK II is a completely new machine code program supplied in Rom. Operation speed is up to 5 times faster than SPELLCHECK I and larger pieces of text may be held in memory. The same version will also check both VIEW and WORDWISE. A dictionary disc is still supplied including 6,000 words, but a data compression technique is used to ensure that well in excess of 17,000 words may be stored on a 100K disc. Ingenious hashing and virtual file access routines have also considerably speeded up the time taken to check text. This sophisticated program is fully 6502 Second Processor compatible and uses the extra memory to further improve word retrieval time.



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How do I turn the sound off?

Is it FX3 or 4 that . . .?

How do I turn the cursor off?

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?

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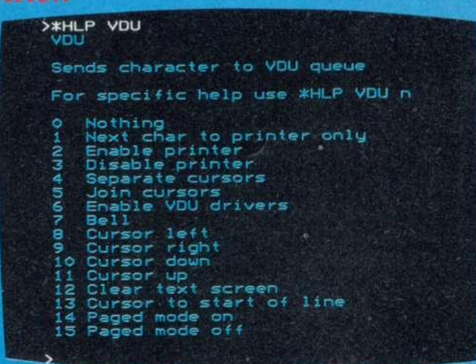
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Command entry

Control Screen

Program screen

Printer, Breakpoint, Trace, Single step, Status

Dual screen status

Tab toggles between screens

TAB

Space bar single steps

SPACE

SLEUTH allows you to single step through your Basic program instruction by instruction, watching your screen display as it is built up. Simply press the Space Bar to execute the next instruction. Alternatively you may watch SLEUTH's control screen as you step through your program. (Press Tab to toggle between your own screen and the control screen.) This will show you the next instruction to be executed and allow you to list any part of the program. Also displayed will be the contents of all variables associated with the current instruction and the values of other specified variables.
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Vincent Fojut looks at two new second processors, aimed at industry and

6809 A USEFUL NUMBER

considerably cheaper than comparable alternatives, based on the 6809 micro

ALTHOUGH second processors based on the 6502 and Z80 have received much attention lately, a third 8-bit family of add-on processors, based on the 6809 micro, have recently become available. This review compares two competing 6809 systems for the BBC micro, and considers how they differ from the alternatives.

The two systems are the Cube Beeb-Flex from Control Universal, and the simply-titled 6809 second processor from Cambridge Microprocessor Systems (CMS). Both offer a surprisingly similar complement of facilities and software support. The major immediate differences are in the packaging of each system.

CMS have squeezed all their hardware onto a single board which is slightly longer than a standard Eurocard. This fits neatly under the lid of the BBC micro's casing, and connects via a short cable directly to the Tube interface. Alternatively, using a longer cable, the card can be mounted in a standard Eurocard rack, and linked to additional boards via its Acorn bus-compatible 64-way indirect connector.

The board is populated with a 6809 central processing unit (CPU) running at 1MHz, a full 64k of RAM, a 4k monitor EPROM (plus space for another 32k of memory) and a couple of 6522 interface chips which act as a link to the Tube. Though not as efficient as a custom-designed Tube ULA (uncommitted logic array) chip, the speed of throughput using the 6522 versatile interface adaptors (VIA) is still acceptable.

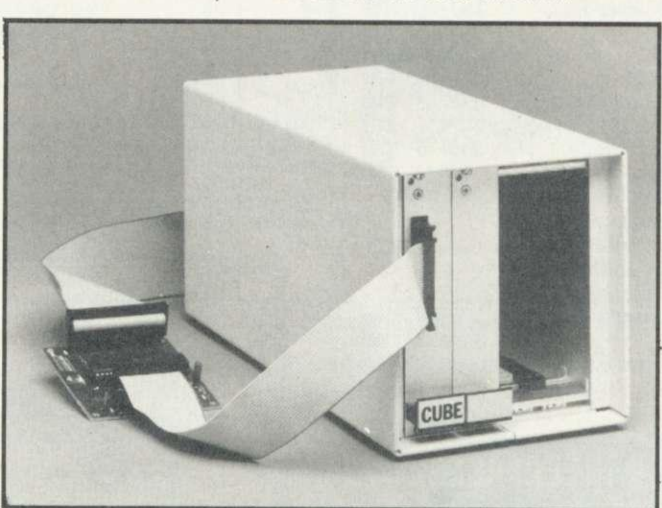
Power is taken from the Beeb, so you must run your discs from another source if they're not fitted with their own supplies. Also, if your BBC micro already has expansion boards of one sort or another, you may have to mount the second processor externally. However, if your desktop is already cluttered, installing the board internally is a great space-saver and the end result is quite unobtrusive.

Control Universal have adopted an altogether more substantial approach to their packaging. Three separate circuit boards make up the system:

- A 6809 CPU card which houses the processor, 4k monitor EPROM, scratch-pad RAM and a single VIA
- A 64k dynamic RAM card
- A small Tube interface card, holding a second VIA.

The first two boards are standard Eurocards, and are housed in a metal four-slot mini-rack with an integral power-supply, finished in beige to match the Beeb. Two remaining slots are therefore available for future expansion.

The Cube Beeb-Flex uses the same dual VIA approach to connect the system to the BBC micro's Tube interface. Since only one VIA can fit onto the CPU card, another small card is needed to hold the second VIA chip. This can be installed within the Beeb (secured to the underside of its lid), or left to flounder untidily on your desktop.



The Cube BeebFlex is made up of three circuit boards

With the aid of appropriate software, both 6809 systems give the BBC micro user access to the range of software written under Flex, the standard disc operating system for the 6800/6809 family.

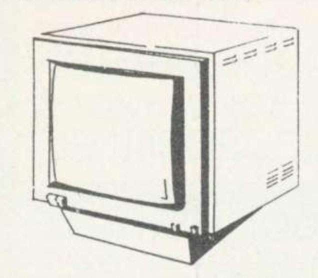
The CMS system was supplied for review with a BBC disc holding two important programs. The first allows discs to be formatted to standard Flex requirements and run on BBC hardware. The second program, together with the monitor EPROM on the 6809 card, provides the necessary link software for inter-processor communication. Executing the program automatically transfers control to the 6809 monitor – a "CMS >" prompt denoting all is well. With the Control Universal set-up, this linking and formatting software is supplied on a sideways ROM, for permanent installation in the Beeb. Obviously, this latter option is slightly more convenient, providing you have the space for yet another ROM. Typing *FLEX enters the 6809 monitor.

The monitor software is virtually identical on both systems. The range of commands offered is shown in tables 1 and 2 overleaf.

Overall, the Control Universal monitor has a rather unfinished feel to it. For example, I tried dumping the last page of memory (&FF00 – &FFFF) to the screen. Once the end of memory was reached, the dump 'wrapped-around' to low memory (0000 onwards), and would continue to dump *ad infinitum*. Control Universal claims that an improved version of the monitor, which rectifies these oversights, may soon be available. The range of commands is also limited – a command to change register values during the program de-

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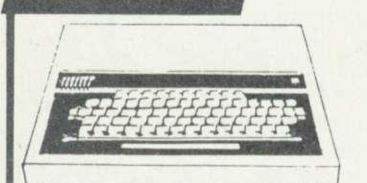
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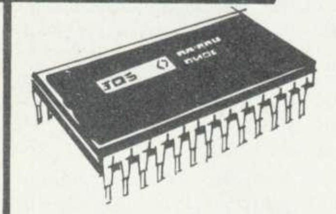
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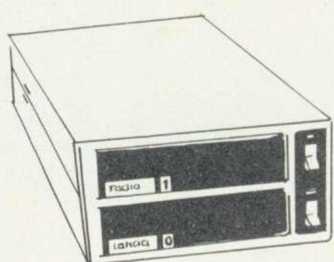
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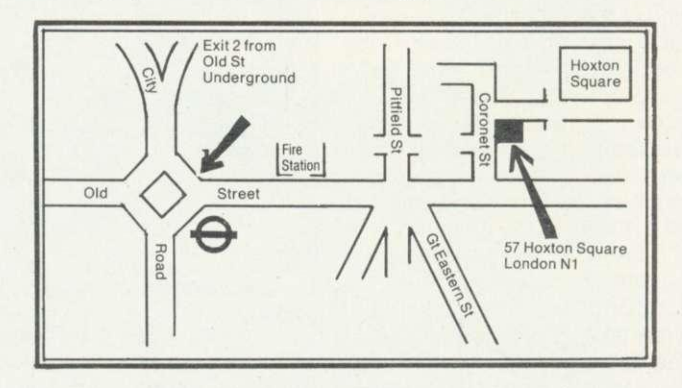


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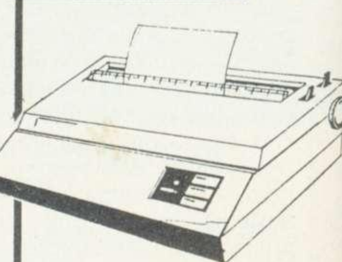
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bugging process would not go amiss.

Flex is probably the most popular disc operating system (DOS) for the 6809. It has established a reputation for elegance, sophistication and user-friendliness. The implementation supplied with both products comes complete with a 6809 macro-assembler and a line-orientated text editor. Documentation for the DOS, assembler and editor is provided in a comprehensive 200-page manual.

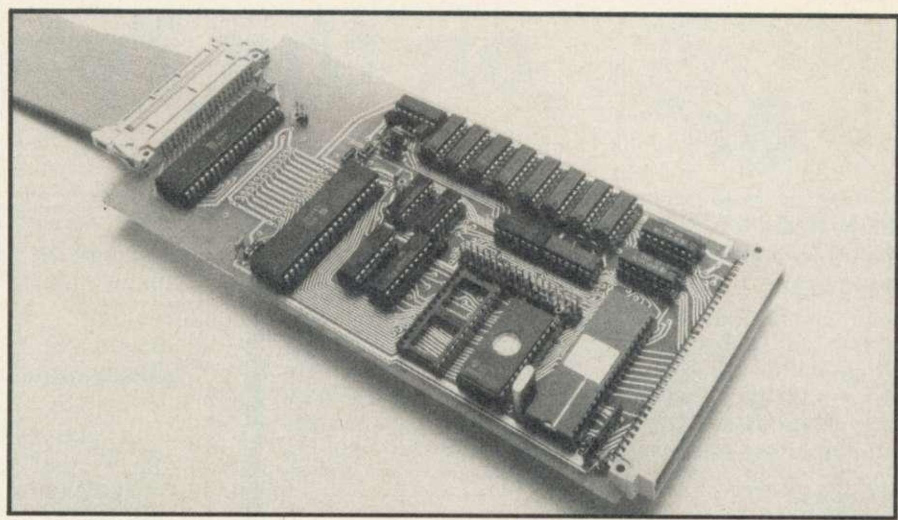
The Flex DOS assumes the system on which it is running has at least two disc drives. It has been configured to use the Beeb's disc interface via calls to routines within the Beeb's DFS ROM. I was disappointed by the speed of many disc operations. Creating a Flex system disc (one from which the DOS can be loaded) took approximately six minutes, using a Beeb fitted with Acorn's DFS. It is interesting to note that CMS recommend the Watford DFS as being twice as fast as Acorn's DFS 0.90, but I was, unfortunately, unable to check this. Similarly, those lucky enough to have the new Acorn DNFS should also find disc operations much faster (see George Hill's comments on page 104 of *Acorn User*, September 1984).

With either system monitor in control, Flex is copied into RAM by means of the 'U' command. This initialises the Flex disc operating system. Unlike the range of DFS software for the Beeb, which is all ROM-based, Flex holds virtually all its commands on disc in the 'Utility Command Set' (UCS). One great advantage of this arrangement is that further commands can be appended to the UCS with ease, by adding suitable command files to the system disc. This in no way encroaches on free memory, since the extra commands stay on disc, and are only loaded when required. (To complicate matters, CMS have recently announced that a 16k EPROM is to be made available, holding linking software, formatter and Flex in firmware – eliminating the need to load Flex from disc on startup.)

Memory requirements can be seen from the system memory map (figure 1). An uninterrupted 48k of RAM is normally available to the user, but once a language interpreter/compiler is loaded into this area, the amount of free memory is reduced.

Undeniably, the range of software available under Flex is not as extensive as that for CP/M, especially in the area of commercial business applications. However, there is still a wide variety of sophisticated programs and languages accessible to the Flex user.

Both companies are aiming the board predominantly towards the pro-



The CMS 6809 second processor squeezes all the hardware onto a single board

Command	Meaning
U	Boot a Flex system disc
K	Fill memory area with specified byte
C	Perform cyclic redundancy check
M	Memory examine/modify
G	Execute program at specified address
N	Execute program at (current program counter + 1)
Q	Test memory area
D	Dump memory to screen/ printer
L	Load 6809 memory from 6502
S	Save 6809 memory to 6502
O	Branch offset calculator
F	Flex warm start

Table 1. CMS 6809 monitor commands

FLEX 0.1
C <adr1> <adr2> CRC check
D <adr1> <adr2> Dump memory
F FLEX warm start
G <adr> Go to Hex address
I Initialise Monitor
K <adr1> <adr2> <data> Fill memory
L <adr1> <adr2> <FROM> Load 6502 RAM
M <adr> Memory examine
O <adr1> <adr2> Offset calculation
Q <adr1> <adr2> Test memory
R Registers
S <adr1> <adr2> <TO> Xfer to 6502 RAM
U Up load FLEX

Table 2. CubeFlex 6809 monitor commands

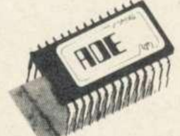
fessional engineering market, as a low-cost development system for dedicated applications. CMS offer the 6809 card in a compatible single-board controller (SBC) format, for use in final application hardware. The SBC can also accept low-power CMOS RAM, and has facilities for battery backup. Similarly, the two main boards in Control Universal's BeebFlex are standard Eurocards from the extensive range manufactured by the company, which are mostly available in anything from fully-assembled form, right down to bare boards. Therefore, using either 6809 system, applications can be developed with the BBC micro/second processor combination, then transferred to identical dedicated hardware.

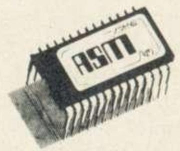
Software development is by no means limited to the 6809. A wide range of cross-assemblers and disassemblers are available for most popular 8-bit CPUs (including the 6800, Z80/8080 and 6502 families), and even bigger beasts like the 16-bit 68000 are catered for. Users of the 6502 are particularly well-blessed – in addition to the above tools, a 6502 machine simulator is available, to allow testing/debugging of 6502 code, using the 6809. There is even a package to perform 6502 to 6809 machine-code translation.

The 6809 is generally considered to be the most elegant and powerful of all 8-bit CPUs. To solve a given software problem, the 6809 typically takes fewer instructions, less memory, and is appreciably faster than other 8-bit processors, when running at comparable clock rates. However, since the 6809 in each system runs at 1MHz, as opposed to the 3MHz 65C02 and 6MHz Z80B in Acorn's second processors, the 6809 add-ons do not stand out in terms of speed. Faster versions of the 6809 are available, and it's rather a shame that neither company opted for 2MHz operation – then we might really have appreciated the impressive speed performance the 6809 is capable of.

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tainly no slowcoach, even at 1MHz, and irrespective of speed, the sophistication of its instruction set cannot be ignored. With a copious set of registers, a wealth of true 16-bit operations and an extensive range of addressing modes, even assembly language programming on the 6809 seems rather high-level!

The 6809's advanced architecture has also allowed the efficient implementation of many popular high-level languages. The software development engineer will find a great variety of languages running under the Flex/6809 combination, offering an environment to suit most applications. There are the old stalwarts of computing such as Basic, Cobol and Fortran, and also more modern, structured languages such as Pascal, Forth, C, BCPL and PL/9. This last is a true machine-code compiler, written specifically for the 6809, which offers the ease of high-level programming without sacrificing the speed and hardware-intimacy of assembler. Furthermore, many of the languages running on the 6809, such as PL/9 and certain versions of Pascal, allow programs to be transferred to ROM/EPROM for use in dedicated applications or stand-alone systems.

The 6809 macro-assembler provided with the Flex package is an excellent programming tool. A measure of its versatility is that the cross-assemblers available under Flex, for other CPUs, are actually implemented as 'macro sets' for use on the very same assembler. This saves having to buy a completely new assembler for each different processor you want to program.

The other major program provided with the Flex system, the Text Editor, is a reasonable, but old-fashioned, line-orientated package. It lacks some of the convenience of a full-screen editor, but it is perfectly adequate for creating assembler program source files etc.

The VAT-inclusive price of a 6809-based second processor system with cable, link/formatter software and Flex, comes to around £400 for the CMS version, and about £490 for the cased and powered Cube BeebFlex. This clearly makes either 6809 option more expensive than other extensions based on the 6502 and Z80. However, though there is obviously some overlap, each system addresses distinct sectors: the Z80 add-on for business, the 6502 variant for sophisticated home/educational use, and the 6809 version for industrial/technical development.

Which of the two 6809 second processors is better? The CMS system is compact, relatively low-cost, and if you don't plan further expansion, this would seem to be a sensible choice. If you do want to expand, or don't have the space

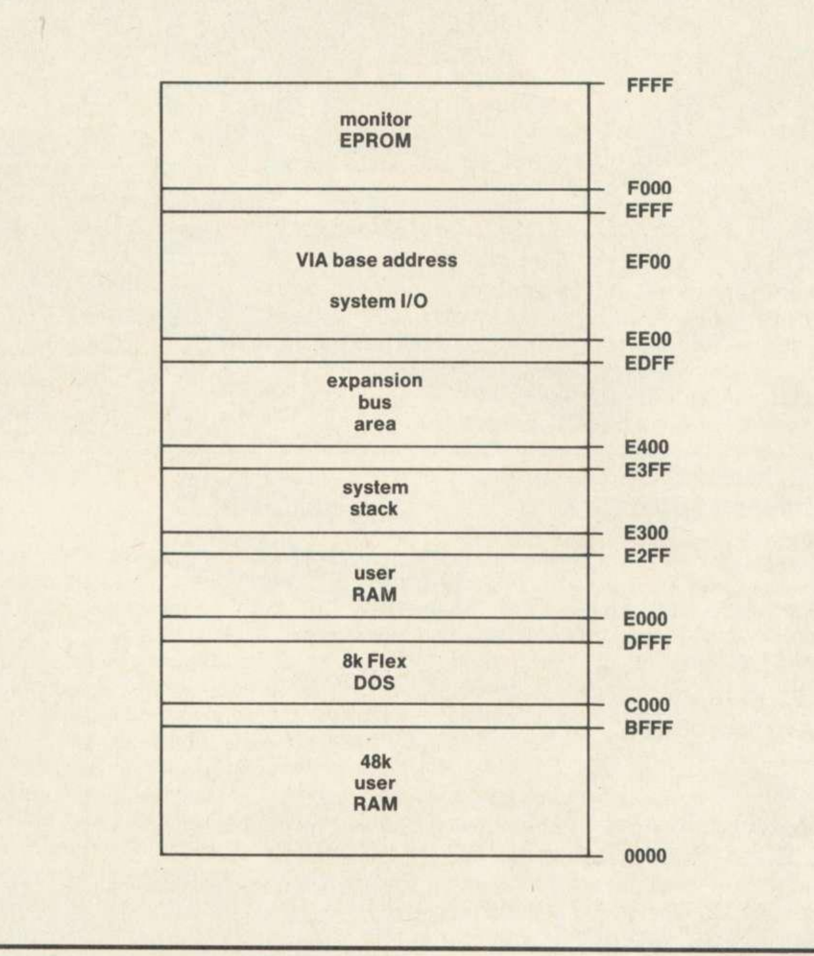


Figure 1. 6809/Flex system memory map

and surplus power for another add-on, Control Universal's package is rugged, self-powered, and has two spare expansion slots.

If you envisage really extensive expansion, it's worth remembering that either system can be housed in a much larger rack. Since both use Acorn bus-compatible connectors, cards from either company (and others) could be mixed on the same system. Control Universal's range of Eurocards is very wide, offering high-resolution colour graphics, disc controllers, analogue and digital I/O, EPROM programmers, etc. CMS are rapidly developing a similar range of expansion cards.

One of the languages you cannot run on the 6809 add-on is BBC Basic, which is available in forms suitable for both the 6502 and Z80 second processors. However, the advantages far outweigh this shortcoming. What the 6809 systems offer is an 8-bit processor which is second to none in terms of programming elegance, a sophisticated and user-friendly disc operating system, and a wide range of powerful programming languages and development tools.

Undoubtedly, for those with the appropriate Beeb hardware, either product offers a 6809/Flex system at considerably less cost than comparative alternatives. I can see both configurations proving very popular with industry, higher education, and even a few well-to-do hobbyists.

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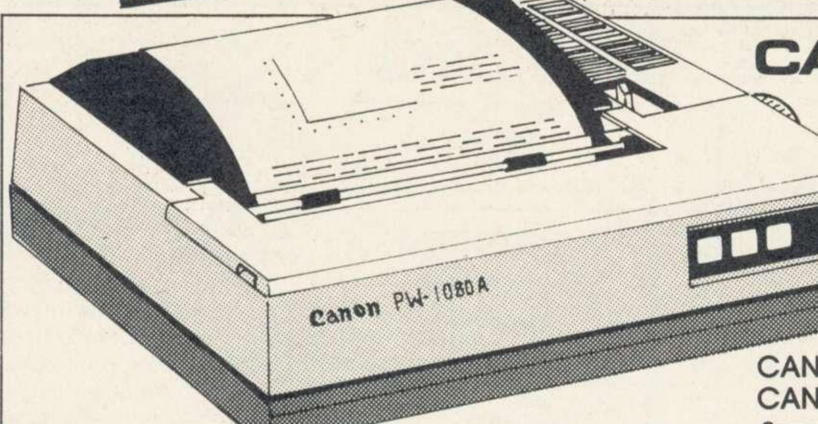
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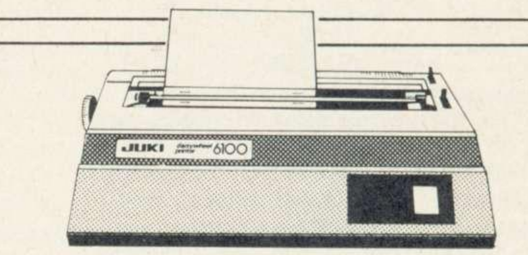
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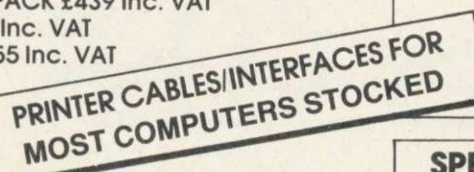
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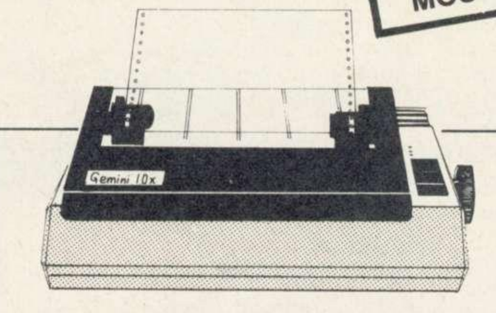
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TOP FORM MONITORS

Harry Sinclair looks at 10 machine code monitors and gives them all a good end of term report

WHAT is a machine code monitor? Let's get one possible cause of confusion out of the way – it's got nothing to do with posh TV sets which cost a fortune but won't let you watch *Dallas*.

The monitors covered here are pieces of firmware – programs which are not designed to be modified by the user. They are chip-based and plug into one of the sideways ROM sockets in the BBC. Only *Starmon* is available for the Electron.

A monitor allows you to do three basic things: inspect memory, alter memory and execute machine code in a controlled manner. The ten products perform these tasks to a high standard – there isn't a bad one among them. Some are easier to use than others, and some perform particular tasks better, but overall I would recommend any of them.

What I'll do is highlight the good points and leave you to decide. The fact that a monitor is not mentioned under a particular task heading doesn't have great significance – it just means that, in my opinion, the ones named do a better or more interesting job.

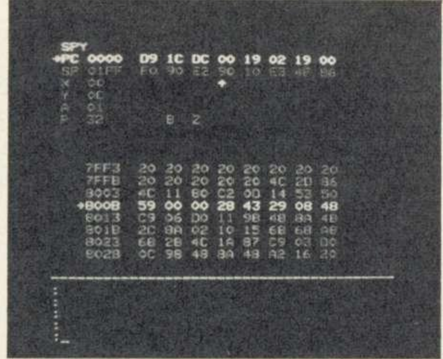
The adverts might lead you to believe there's not a great deal of difference between monitors – not surprising when they're supposed to perform the same tasks. What is striking, however, is just how different their approaches are.

An important fact to bear in mind is that, other than *Toolstar* which operates as a service ROM, all are languages (albeit simple ones) in their own right, with a vocabulary and syntax. You won't have to master a language as complex as Basic, because most use single letter commands and you don't have to program, but you will have to learn how to use them – and none is particularly user-friendly.

Inspect Memory

There are two conventional ways of displaying memory – hex/ASCII dump and disassembly. (ASCII, by the way, stands for American Standard Code for Information Interchange, a system designed to standardise the representation of data and so ease the passage of information between machines of different manufacture.)

The hex/ASCII dump lists memory from a point set by you, usually a screenful at a time. The layout is normally lines of the contents of eight consecutive locations, printed in hex notation. On the right of the screen are printed the equivalent ASCII characters. Some monitors, like *Spy2*, just give one display and allow you to toggle between hex and ASCII. No attempt is made to represent control codes 0 to 31, or those higher than 127. A full stop is usually shown instead.

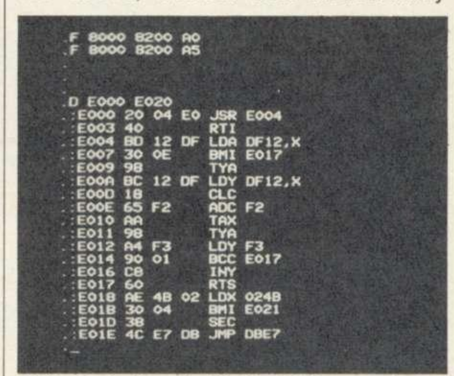


'Spy2': good monitor and powerful set of disc-related commands

Disassembly shows the contents of memory interpreted as program code and displayed in assembler mnemonics – eg, LDA #&2E:JSR &FFEE. Any section of memory containing values which are not valid op-codes is highlighted. This generally means you are looking at data rather than code.

All these monitors will disassemble adequately, but by far the best for this is *Mach1*. In addition to standard disassembly it provides the marvellous facility of auto-disassembly. This automatically labels all subroutines, code to which a JMP or a branch is made, and memory locations which are written to or read from. All OS calls, vectors, Fred, Jim, Sheila etc, are labelled. It also enables you to give any location or subroutine a name and it displays that name wherever it is referenced. You can define any byte or section of bytes as code or several types of data and this will determine how it is displayed. If a piece of object code is designed to reside and run in an awkward location, such as in ROM or below &C00, you can load it or move it into a more accessible position in RAM and use the offset facility. This will disassemble the code as if it were in its proper place while still allowing access to it. You can even insert comments into the display. Information on these names, definitions and comments is held in compact tables and can be saved separately, so you can have a complete disassembly without saving either source or object code. It also means you can pass on that complete disassembly to someone else who owns a copy of *Mach1* and the object code without infringing copyright. Gnomonica hopes to build up a library of disassemblies for its customers. The number of facilities offered by *Mach1* for disassembly is so large that the whole of this article could be devoted to them and still not cover them fully.

Kmon provides a cut-down version of the above, without auto-disassembly and some other refinements. An honourable mention goes to *Spy2* which has an excellent routine, XLST, to differentiate between data and code and display them accordingly.



'Debug': designed with the 6502 second processor in mind

All the monitors except *Aid* allow you to inspect all memory, including the paged memory between &8000 and &BFFF where Basic normally resides, so you can look at any other ROM in the machine. Strangely, *Aid* only allows you to inspect itself so you can't even have a look at Basic. *Page 185* ▶

CLARES №1 IN UTILITY SOFTWARE!



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✱ INPUT is a routine included on the disc which will allow you to write utilities for accessing your data and tailored specifically to your needs.
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NEW ONESHOT: £12.00 DISC

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- Obey fixed instructions before executing a line.
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- "Printer only" will force trace output to a printer allowing full screen display.
- Ability to dynamically alter control of ONESHOT.
- ONESHOT can be configured to run in any area of memory.

ONESHOT is a 1.25kb machine code program which gives the user several powerful aids in debugging BASIC programs. These include the ability to SINGLE STEP through the BASIC code of the target program, stopping the processing at specified points and comprehensive trace functions of the variables used by the target program.
A very powerful option allows the user to enter a command string into function key 0 and instruct ONESHOT to obey this command BEFORE each line is executed e.g. *KEY0 PRINT X%¦ M will print the value of X% before executing each line. This is a very simple example and it is possible to do much more complex things including printing the value of a variable only when it changes or when it reaches a certain value or falls within a certain range. This option can also be used to dynamically alter ONESHOT as it is working. The power of this option is only limited by the users ingenuity.
In addition to ONESHOT the disc also contains 3 very useful function key routines. The first will search for any DEFPROC or DEFFN and print the line numbers in which they appear together with the name of the procedure or function. The second will search for a specific procedure or function and print the line numbers containing it. The third routine will print out every active variable together with its present value.
ONESHOT is not compatible with double density interfaces.

NEW FUN HOUSE: £10.00 DISC

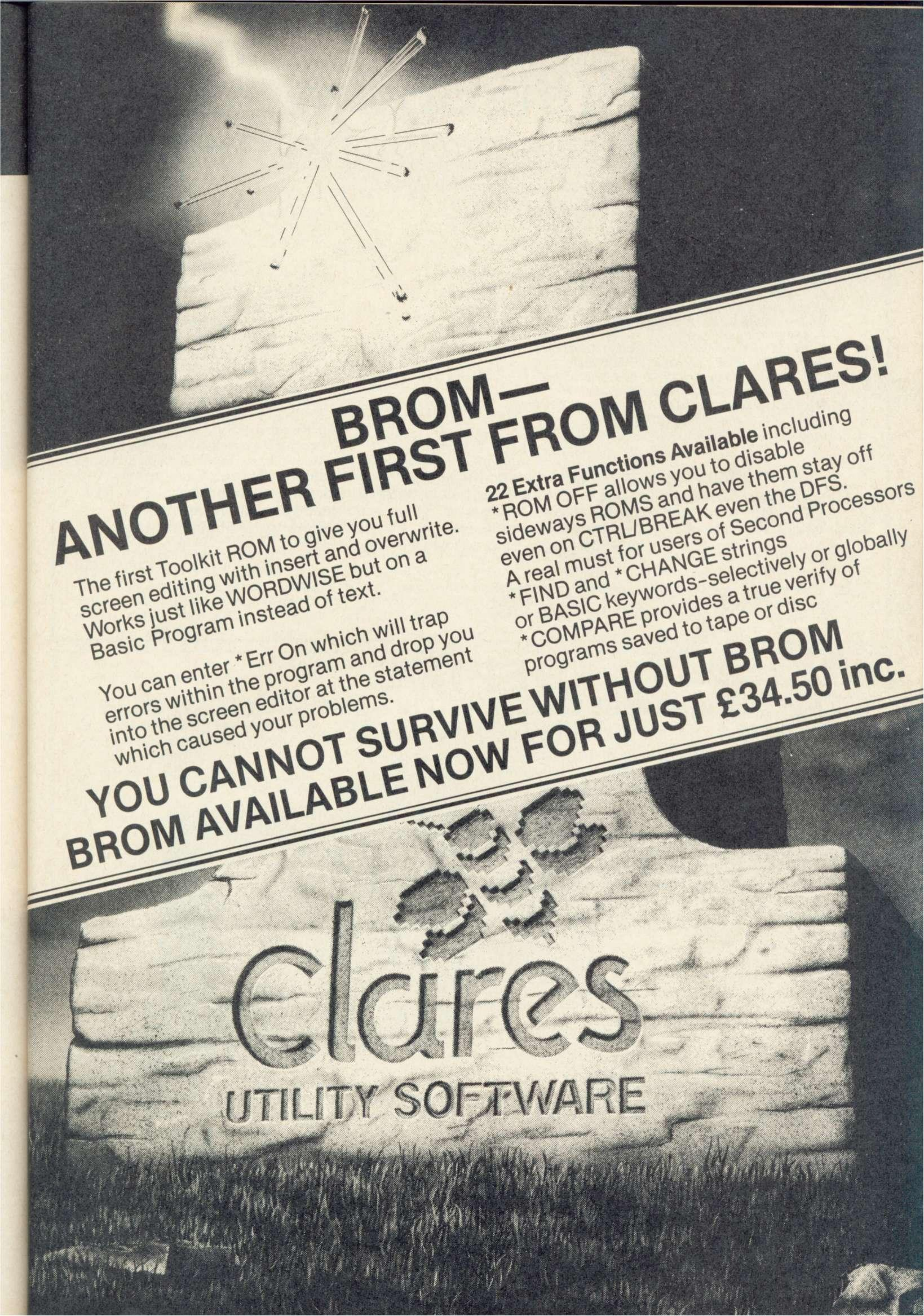
FUN HOUSE is a highly original suite of educational programs suitable for ages 3 to 13. The program is designed to encourage children to spell words which relate to objects found around the home. Animation and music are used to good effect and some highly original ideas are incorporated.
Each room exercise is terminated with a warning item e.g. the lounge finishes with 'FIRE' which goes on to engulf the whole lounge. Tests with a newly hired 4 year old resulted in us having to prise him away from the keyboard after 2 hours. In that time he had gone from never having used a keyboard to finding the location of all the keys very quickly and entering the correct answer. He had thus started on the path to learning spelling and familiarised himself with the keyboard including the use of DELETE to correct his mistakes. Can you afford not to give your children the same start?

FUN HOUSE is not compatible with double density interfaces.

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Debug takes the opposite tack and lets you look at everything but *Debug*, which it rather glumly informs you is not open to inspection for copyright reasons. Happily, none of the others has any such scruples and all will let you look at *Debug* as well.

For plutocrats with the 6502 second processor, *Starmon*, *Mach1* and *Debug* will also disassemble code over the Tube. I'm told the latest *Spy2* works with the second processor, having separate screens for each side of the Tube. However, only *Mach1* supports the mnemonics for the entire op-codes on the 65C02, and for disassembly only.

The authors of *Spy2* and *Toolstar* take the reasonable view that discs are part of available on-line memory and have provided facilities for their inspection and modification, as well as useful commands for formatting, verifying, etc. *Spy2* is particularly well heeled with disc commands. *Debug* has some suggestions on using OSWORD &7F to enable disc editing but this is rather a do-it-yourself job.

Another aspect of memory inspection is searching and these ROMs do this in one form or another. With the exception of *Debug* all will allow a search for a pattern of bytes, and all except *Kmon* provide a search for a string. *Debug*, *Mach1* and *Gremlin* let you input what you want to look for in the form of assembler mnemonics. Very usefully, *Debug* has provision for 'wildcards' in this search using '*', to look for something like LDA (**),Y CMP #20 BEQ #**. *Spy2* lets you search any disc as well. As with memory inspection, searches can be carried out in the paged ROM area although the restrictions mentioned above still apply with *Aid* and *Debug*. Again *Debug*, *Starmon*, *Mach1* and the latest *Spy2* will work in the 6502 second processor.

Output to printer and/or file is possible with all the ROMs. *Exmon* and *Gremlin* have a routine which is a lifesaver. If you have object code but have lost the source code (as I regularly do) or never had it, you can spool the disassembly to disc or tape. The file produced can have a header such as AUTO so that EXECing it re-creates the source code and saves a lot of typing.

Alter memory

Byte and string insertion, the entry of code, and the alteration of the 6502's registers come under this heading. Let's get the simpler ones out of the way. All these monitors permit insertion of individual bytes and filling blocks of memory with byte patterns for those developing ROM software. All enable the user to shift and compare blocks of memory and there is little to choose between them.

SUPPLIERS AND PRICES

	Price	Version	Supplier
Aid	£28.00	1.21	Lincoln Microsystems, Dept DP1, 22 Lagan Walk, Peel Hall, Manchester M22 5WG
Beebmon	£22.00	1.00	Watford Electronics, Cardiff Road, Watford, Herts
Debug	£39.95	1.00	Microchoice, 159 Havant Road, Drayton, Portsmouth PO6 2AA
Exmon	£27.00	1.1a	Beebugsoft, PO Box 109, High Wycombe, Bucks HP11 2TD
Gremlin	£33.35	1.21	Computer Concepts, Gaddesden Place, Hemel Hempstead, Herts HP2 6EX
Kmon	£34.00	1.00	Kansas City Systems, Unit 3, Sutton Springs Wood, Chesterfield S44 5XF
Mach1	£39.95	1.06	Gnomonica, 2 Stable Cottages, Rusper Road, Capel, Dorking, Surrey RH5 5HE
Spy2	£30.00	2.01	System Software, 12 Collegiate Crescent, Sheffield S10 2BA
Starmon	£27.50 BBC £22.50 Electron	1.2	Slogger Software, 215 Beacon Road, Chatham, KentToolstar
Toolstar	£34.00	1.77	Pace Software Supplies, 92 New Cross Street, Bradford BD5 8BS

The relocation of program code is a thorny subject, but five of these ROMs provide routines to make it easier – *Aid*, *Exmon*, *Kmon*, *Spy2* and *Mach1*. The code is modified to enable it to run in its new location, although if you have data mixed in you could get some funny results. Still, it teaches good programming habits – like don't mix code and data, and don't lose source code.

Mach1 also has a 'kill' routine which will remove a specified section of object code from a program and then shuffle up the rest to close the gap. Forward and backward references are modified automatically. There is a corresponding 'insert' routine to allow new sections of object code to be added within a program.

'Exmon': good all-rounder. Version II has graphics capabilities

String insertion is allowed by all but *Aid*, although it's somewhat messy with *Kmon*.

All except *Aid*, *Starmon*, *Toolstar* and *Spy2* have some sort of assembly facility to let you enter data as assembler statements – more of this later.

Altering the A, X and Y registers is a standard provision. Since *Toolstar* is a service rather than a language ROM, this has to be done from Basic using A%, X% and Y%, with C% used to control the carry flag. *Kmon* loads the registers from zero page before executing a routine rather than by direct editing. With *Mach1* it would be necessary to write and execute a small routine to set the registers first and so it's not as flexible as the others in this respect. It isn't possible to alter directly the stack pointer on these three ROMs either.

Although assembler statements can be entered under control of five of these monitors, as stated above, writing programs of any length or complexity while not in Basic is only really practicable with three – *Gremlin*, *Kmon* and *Mach1* – because of the problem of forward references: single pass assemblers do not like undefined variables. *Kmon* and *Mach1* in some ways make an easier job of it. *Kmon* provides line numbers and decent editing. You can mess about with the source code (stored in compacted form) as much as you like. Listing is just like Basic, but if you want to insert an extra line, the editor inserts it and renumbers later lines. Deleting code operates in a similar fashion. When you've finished, just press '@' and the code is assembled. Saving or loading source code is simple as well.

Mach1 doesn't actually generate any source code, but still has facilities for labelling, commenting etc. The *Gremlin* manual recommends using a wordprocessor or text editor for generating source code which is then EXECed under *Gremlin*'s control in the same way that Basic would handle it, ie, using two passes. The advantage of using these ROMs rather than Basic to





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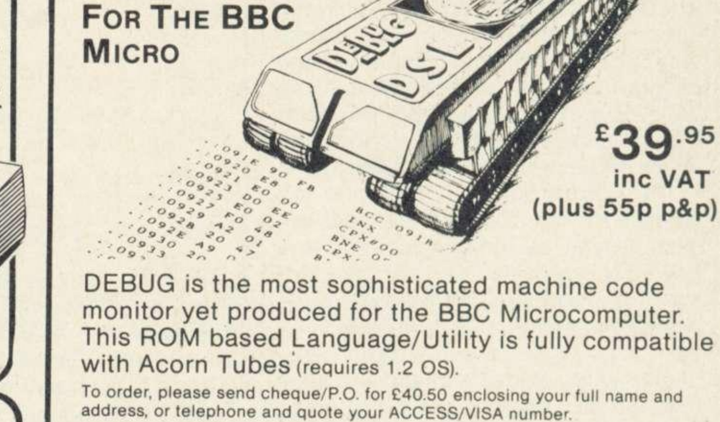
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assemble is that they have a wide range of pseudo-ops available, although none supports macros.

Executing code

A tricky area this. All allow controlled execution of code. *Toolstar* has break handling facilities and in some ways is very flexible since the code is CALLed from Basic and all Basic's facilities are accessible, such as changing mode, colour, etc. It doesn't allow single stepping and is not really on a par with the others. To be fair to Pace this ROM is a general utility and was not designed as a full scale, dedicated monitor.

The rest fall into two groups – those that permit controlled execution of graphics routines and those that don't. The big difficulty is the fact that the 'front panel' displays are usually fixed in mode 7. *Beebmon* and *Spy2* for instance won't change mode even if you execute some code which should make them do it. All the monitors will allow the controlled execution of graphics code, you just can't see what's going on unless it's in mode 7! Before you change mode, *Mach1* and *Kmon* require you to shift their tables into an area of RAM where they will be safe.

Since code execution is such an important function, the table below shows what I consider to be the main characteristics of each of the ROMs.

What they offer

Breakpoints enable the user to stop a piece of code at a predetermined point and look at the 6502's registers etc, for debugging, and I don't think you would find yourself short of them with any of these monitors. Code is usually tested one section at a time so you can get away with just one if you try. I've used the definitions 'ghost' or 'real' in a slightly unusual, but I think more accurate, way in the table. The type of breakpoint is perhaps only significant if you're doing one of two things. First, running a piece of self-altering code, where the first section operates on an apparent jumble of data, EORing it etc, to eventually produce the second section and then branches to it. You may want to produce this type of code to protect your software. Inserting a real breakpoint (zero byte) into the second section before operations are carried out will obviously produce the wrong result. The second use is to allow breakpoints in ROM. This is what *Beebmon* does.

Two moinitors, *Beebmon* and *Starmon*, offer the impressive facility of conditional breakpoints, although in a slightly different manner.

As well as providing simple breakpoints, *Starmon* allows the user to specify that the BRK should occur only if certain conditions are true. Up to two conditions are permitted and they can be linked by AND or OR. For instance, you could set a break at location &2042 which will be actioned only when, say, ?&70>=24 and ?&3060<=96. Very clever. In addition you can set a trace of locations in which you are particularly interested so that they are displayed along with the registers at each breakpoint or each step when single stepping.

Beebmon offers a different sort of conditionality. Instead of just setting a breakpoint at a specific location, you can also cause one to occur when a particular byte is written to or read from, or when one of the A, X or Y registers contains a certain value. This is powerful stuff, since the breakpoint can occur anywhere. When it does, the program counter, the disassembled instruction at that point, and the contents of the registers are displayed, together with the breakpoint number. Even more impressive is that if you've set a BRK to occur, say when &258 is written to, it doesn't just happen when the instruction STA &258 is about to be actioned, but also when the instruction is something like STA &190,Y where Y=&C8, or even with STA (&76),Y. The address counts, not how it's expressed.

Beebmon is also the only monitor reviewed which permits breakpoints to be set in any sideways ROM.

Single stepping is allowed by all except *Kmon* in RAM and all except *Kmon* and *Aid* in ROM.

Executing calls to sideways ROMs can be done with any except *Aid* and *Spy2*, although this can sometimes have unexpected results if the called routine accesses memory locations used by the calling monitor. *Aid* has an interesting call facility in reverse, as it were. It's possible to run a program which is a mixture of Basic and machine code, and vector the call to the code through *Aid*, even if the call is passing parameters. If required, *Aid*

MAIN ATTRIBUTES

	Aid	Beebmon	Debug	Exmon	Gremlin	Kmon	Mach1	Spy2	Starmon	Toolstar
Number of breakpoints	12	8	8	5	8	10	N/A□	8	1	N/A□
Type of brkpt – ghost or real *	R	G	R	R	R	R	G	R	R	R
Conditional brkpts?		●							●	
Brkpts in ROM?		●					● •			
Single step	●	●	●	●	●		●	●	●	
Single step sideways ROM †		●	●	●	●		●	●	●	
Execute S/W ROM routines †		●	●	●	●	●	●		●	
Limit debug area		●	●		●		●	●		
Change mode	●		●		●	● ⊕	● ⊕			●

Notes: * *With 'real' brkpts the instruction BRK (00) is actually put into the program although the original contents of the location are saved for later re-insertion (except Toolstar). 'Ghost' brkpts do not alter the code.*

□ *With* Mach1 *labels can act as brkpts so the number is limited only by number of labels you define. With Toolstar you have to insert BRK into the code yourself, but there is no limit to the number you can insert.*

• *Not in sideways ROM, only between current &8000 and &FFFF.*

† *There is a possibility of conflict with some of these ROMs if the sideways ROM routine being executed or single stepped accesses locations, particularly zero page, which are also being used by the controlling monitor.*

⊕ *The default position for the user tables for these ROMs starts at &5000 and this will need to be changed before changing mode to keep them below HIMEM, otherwise they will be overwritten by screen memory.*

will preserve the program's screen, no matter what mode it was in, allow you all the monitor's debugging facilities, using *Aid*'s own mode 7 screen and the program screen, and finally return you to the correct place in the Basic program with the program screen intact.

This dual screen feature is a cracker. After entering *Aid*, you can set up another screen in any mode, issuing whatever VDU commands to it you like. If you have a machine code graphics routine you wish to test, you can single step through it or run it with breakpoints etc, and *Aid* will switch between the two screens without corrupting either. *Aid*'s use of zero page is transparent and doesn't interfere with any use of the same locations. It's a very impressive piece of work. As with all good things, there is a price to pay. In this case, when 'dual screen' is operative *Aid* needs six pages (1.5k) of RAM at or above &E00 to store its own screen data but, unless you have some long graphics routines in the 20k modes, this shouldn't prove too inconvenient.

Beebmon not only allows calls to routines in sideways ROM, but can run the whole ROM. It's possible, say, to take control of Basic – loading programs, listing them and even running them. All the breakpoint facilities, etc, are available while doing this. It also allows screen output from the Basic program on its own mode 7 display area.

Being able to limit the debug area is useful, particularly for single stepping. You don't want to have to single step all the way through subroutines that are already debugged, or through OS calls. The five monitors that allow this do so either by letting you define the areas you don't want to look at, or by letting you execute JSRs in one step.

```
    A=00     X=40     Y=01
S =01FF 89 10 E3 B8 93 93 DC 89 ........
PC=1A02 00 00 00 00 0D 6F 6D 70 .....omp
        BRK
   7FF2 20 20 20 20 20 20 20 20
   7FFA 20 20 20 20 20 20 C9 01
M =8002 F0 1F 60 EA 60 0E 01 42 ..£.£..B
   800A 41 53 49 43 00 28 43 29 ASIC.(C)
   8012 31 39 38 32 20 41 63 6F 1982 Aco
   801A 72 6E 0A 0D 00 00 80 00 rn......
----------------------------------------
GREMLIN

!D E004 E012
LDA DF12,X
BMI E017
TYA
LDY DF12,X
CLC
ADC F2
TAX
TYA

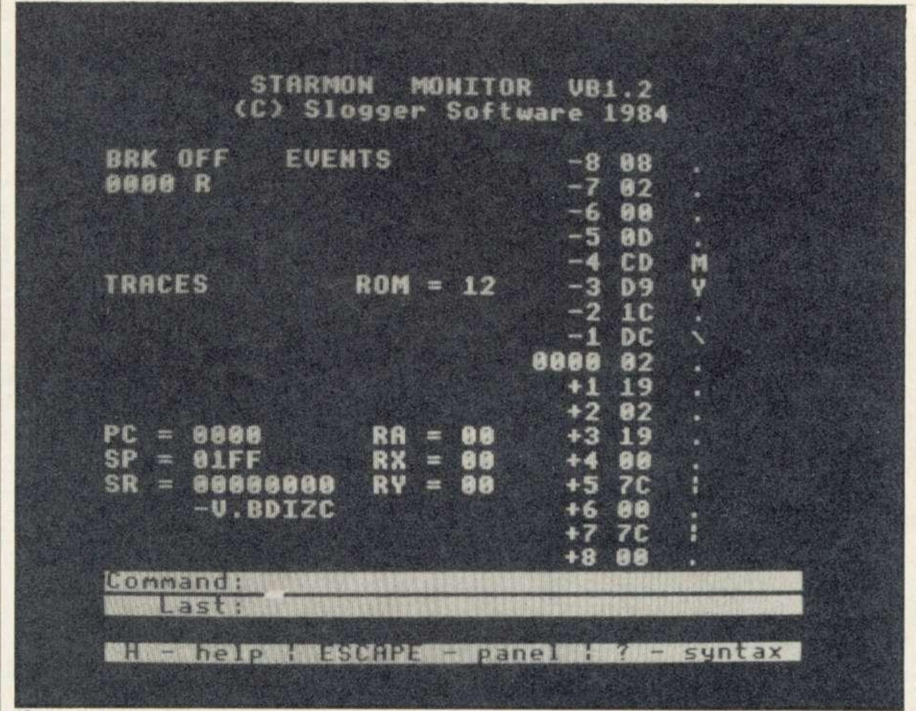
1_
```

'Gremlin': best all-rounder with a nice spread of uses

The final item in the table relates to mode changing when debugging graphics routines not in mode 7. I have already described some of the facilities offered by *Aid*, which sets the standard in this area, and only *Gremlin* comes anywhere near. It accepts the command 'MODE', and if a 20-column mode is selected or the status display shown, the whole screen is available for your routines, single stepped or CALLed. *Gremlin* does have the advantage of requiring no additional memory to do this but the disadvantage of not having a status display, although this can be output to spool file or printer. The others that permit mode changing will write their status display all over your graphics if you single step or hit a breakpoint.

Conclusions

This article covers only the things I consider very important, since I couldn't hope to deal with every aspect of each monitor. I've left out a whole range of topics, from expression evaluation to memory usage. Which one is best for you will depend on what you want it for. No one monitor offers everything, though all are good.



'Starmon': a mode 6 display ensures that Starmon will work on the Electron as well as the Beeb

If you have an Electron the choice is easy – only *Starmon* is on offer and an excellent product it is too, even if some BBC owners might find its mode 6 format a little restrictive.

I felt a little uncomfortable including *Toolstar*. It's a toolkit and provides a range of powerful commands for you to build up into even more powerful routines and has by far the best and most helpful documentation. Only a third of its utilities are directly concerned with machine code; the rest are for Basic and disc. If you're a keen Basic programmer, have discs and are interested in, but not consumed by machine code, this might be for you.

Spy2 has an even more powerful set of disc related commands readily available to Basic or any other language via the OS. It's also a very good monitor.

If you are heavily into m/c graphics, have a look at *Aid* with its lovely dual screen. *Gremlin* has a very nice spread of uses from graphics through assembly and disassembly, and is possibly the best all-rounder, if a little more complex than most to use. *Exmon* is another all-rounder but without the graphics capabilities or the full-scale assembler. *Debug* has many nice facilities, a low profile with no front panel display, and was designed with the second processor very much in mind.

Beebmon has a bright, almost gaudy, front panel and a novel design. If setting all sorts of clever breakpoints in RAM or ROM is your thing, this is the one. It's also the cheapest.

Mach1 and *Kmon* have many similarities and operate in much the same way. *Mach1* is the only 16k monitor in this review, all the others being 8k. It has a marvellous auto-disassembler and now has a full-feature assembler, allowing forward references to undefined labels, and it's the only one which supports the extended 65C02 mnemonic set for the second processor, although not for assembly. *Kmon* strikes me as a cut-down version of *Mach1* with some very nice touches, especially on the assembly side.

Well, there you are, a final thumbnail sketch of each one. No doubt there will be the odd cry of 'foul' and 'we was robbed' from one or two of the authors of these products – all of whom have my admiration. I have tried to be fair and I must stress again that this is simply a collection of my own opinions and prejudices. In the end it's up to you.

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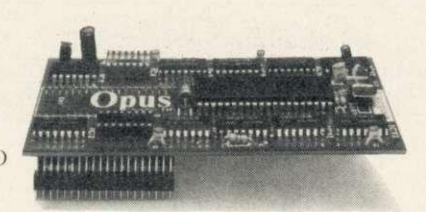
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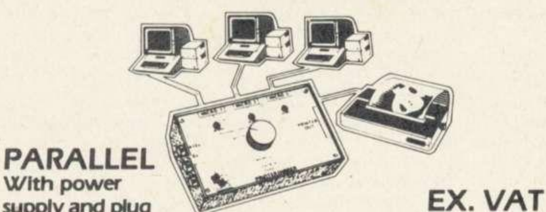
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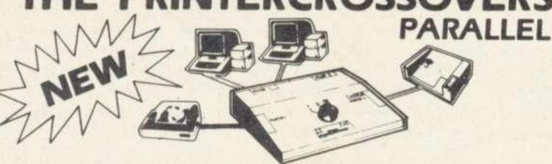
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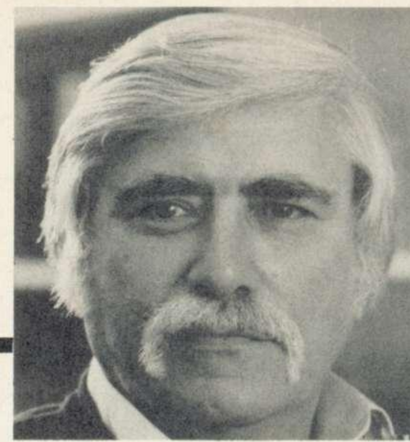
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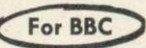
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■ 50% royalties paid for original BBC programs. Send programs on 40 track disc or cassette to AJS, 13 Wishaw Close, Collinswood Chase, Cramlington, Northumberland NE23 6JF.

■ Beam design to BS.449 (steel) and CP.112 (timber) for architects, engineers, builders. Cassette £40, disc £45. SAE to Beamscan, 20 Vaughan Avenue, Hendon, London NW4 4HU.

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■ Data-Logger comprehensive measurement, display routines for analogue port and user port. Interrupt driven and high speed assembler routines. Disc £10. Stainton Hall Technical Software, Stainton, Kendal LA8 0LQ.

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■ Hackers! A guide for the novice in tracing unlisted computer phone numbers, £3.50. Andersons, 56 Waterloo Road, Freemantle, Southampton.

■ 'Nutcrackers': Tape 2 Tape + Tape 2 Disc + Disc 2 Disc + Disc 2 Tape: £5. Rompull + Tapedump: £5. Super disc menu: £5. ROM-filing system generator: £5. R-Soft, 22 Marriotts Close, Felmersham, Beds. MK43 7HD. 0234-781730.

■ Diary: BBC B, organise your life with comprehensive diary/planner. Unique features including automatic reminders. Cassette £10.50, disc £11.50. Intersoft, 7 Richmond Road, Exeter.

■ How-To. An essential collection of S/W plus instructions for frustrated new disc owners. £5. Many satisfied users, R-Soft, 22 Marriotts Close, Felmersham, Beds MK43 7HD. 0234-781730.

We must remind advertisers that we cannot carry advertisements which incite readers to break the protection and therefore copyright of commercial software.

■ Music. Direct type-a-tune program for Electron. Includes 'tunes for typing'. Based on janko layout – approved by Franz Liszt. £1 post free from Qwertonic Press, 71 Elmfield Avenue, Teddington, Middx. TW11 8BX.

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■ 'D-Master': will backup most 8271 formatted discs, £7. For 'Nutcracker' owners, £3. This software can be copied/modified (not resold!). R-Soft, 22 Marriott's Close, Felmersham, Beds MK43 7HD. 0234-781730.

■ Solidisk 128k complete with manual and software on 40 track disc. Worth £150, sell at £115 ono. Tel: Graham, 0253 721291 ext 59, business hours.

■ Acorn Z80 second processor. Complete, unused, unwanted gift. £250. Tel: 01-360 0323.

■ Written any educational software? We pay 20% royalties. Send tapes for assessment to QCSoft, 66 Manor Abbey Road, Halesowen, West Midlands, B62 0AB.

■ Colour screen dumps. BBC with Tandy CGP115, MCP40, Oric printer. Dump your best graphics in full colour. £3.50. 3 Orchard Gardens, W. Challow, Wantage, Oxon OX12 9TL.

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Seconds out ...round two?

THE Christmas punch-up between computer chiefs Chris 'King' Curry and Clive 'Beebcrusher' Sinclair has been referred to the Boxing Board of Control (BBC) and the fight declared void.

The reasons are unclear, but it appears the BBC does not consider the Baron of Beef public house an official venue. Nor was the wine bar where round two took place.

by Itsa Knockout

Also, Clive's use of a rolled-up newspaper in future meetings has been knocked on the head as it was reckoned to be 'a bit below the belt'.

So, King Curry still holds his title as the biggest micro producer in the UK – but Clive is after a rematch and is reckoned still to be ahead of Sugar Ray Amstrad in the UK rankings.

Sources close to promoter Bill Cotton suggest Clive is on course for another crack, possibly at the Blue Boar in Cambridge. Contracts are being negotiated, with several other fights on the bill: Hermann 'The German' Hauser v Nigel 'Naigel' Searle; Guy 'The Mouth' Kewney v Jane 'Vendetta' Bird and 'Mad' Mac v Tony 'Magpie' Bastaole.

Our boxing correspondent writes: The King's trainer at ABC (Acorn Boxing Co), Smokin' Joe Black, reckons he's in good form, whereas the opposition camp is having trouble getting Clive out of his trike and back to training.

Tom in a huff

OUR PAL Tom Hohenberg (aka Huff 'n Puff, Hamburger, etc) must be getting really fed up.

Abuser started the ball rolling by (deliberately) mis-spelling his name. Then Guy Kewney and Computer Weekly started.

Now, the ultimate. One of the Acorn directors, no less, writes to him as Tom Hoenburg!

Acorn's 'bull'

ACORN is to launch an X-series machine this year, but it will not be a successor to the BBC micro model C. The X stands for Excommunicator and, as one of the new management counter-productivity tools, is the result of Acorn's tie-up with the government-sponsored Alvey project.

Using the most sophisticated artificial intelligence techniques, the machine can detect which managers are leaky, and censor all potentially sensitive information, a sort of modern 'papal bull'. Independent industry experts believe this machine was the brain behind the Acorn security operation last year which cut leaks down to one major new product a month.

Chris 'n' Chris were unavailable for comment.

Saddled with a micro mountain

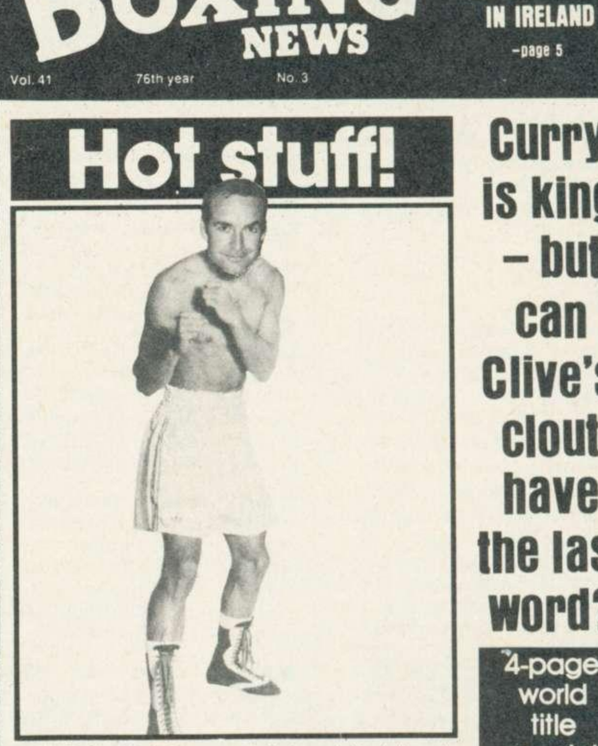
WHAT, we ask, is Acorn going to do with all those duff computers dealers are going to be saddled with under the £50 exchange scheme for the BBC micro?

They could always take a look at the cartoon book '101 Things to do with a Dead Computer', but we'd like to hear some ideas from readers on Acorn's micro mountain – prizes for the best three.

We've asked Acorn if the offer will be extended to C5 owners, but the answer was 'What would we do with them?' However, there were some ideas on the EEC's 'wine lake'.

Acorn 'ad' it up

AFTER forking out a claimed £4.5m on advertising over Christmas and selling 200,000 machines (that's £22.50 per micro!) against a target of 300,000 we can quite understand Acorn asking the advertising company Aspect for some of the money back. The only problem is that Aspect has already spent it – on BBC micros.



January 18, 1985 55p

BOXING NEWS

IT'S TOUGH FOR O'SULLIVAN IN IRELAND -page 5

Vol. 41 76th year No. 3

Hot stuff!

Curry is king – but can Clive's clout have the last word?

4-page world title special -pages 10-13

C5 DRIVER Clive Sinclair has a puncher's chance in his challenge for title of biggest micro company (over-35s), but holder Curry (above) looks an outstanding champion.

How 'Boxing News' reported the first Curry v Sinclair match

FOLLOWING in the footsteps of *The Times* with Portfolio, *Acorn User* is doing its bit to encourage readers to follow the Stock Market with Jingleo, or How Much Acorn Directors are Worth. Our table (based on Acorn's company report) enables us to work out how much they earn as the market fluctuates.

For every penny the share price rises, Hermann gains slightly over £$\frac{1}{2}$m, and Chris slightly under £$\frac{1}{2}$m. At the high of 193p each, Hermann was worth almost £103m, but at 43p his paper fortune dropped to £22m.

Director	Shares	at 193p	at 43p	Change/p
H M Hauser	53,252,851	£102.7m	£22.8m	532,528
C J Curry	43,032,051	£83.0m	£18.5m	£430,320
J W Sutherland	12,500	£24,125	£5375	£125
C J Ward	12,000	£23,160	£5160	£120